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Abbreviated Title	*Journal*
Advanc. Sci., Lond.	Advancement of Science.
Aeroplane	Aeroplane.
Auto. Engr	Automobile Engineer.
Automot. Industr., N.Y.	Automotive Industries, New York.
Bitumen, Teere, Asphalte, Peche	Bitumen, Teere, Asphalte, Peche, und Verwandte Stoffe.
Brandschutz	Brandschutz.
BrennstChemie	Brennstoff-Chemie.
Bull. Amer. Ass. Petrol. Geol.	Bulletin of the American Association of Petroleum Geologists.
Bull. Ass. franç. Tech. Pétrol.	Bulletin de l'Association française du Techniciens du Petrole.
Bull. Main Petrol. Inst.	Bulletin of Main Petroleum Institute Poland
Canad. J. Tech.	Canadian Journal of Technology.
Canad. Min. metall. Bull.	Canadian Mining and Metallurgical Bulletin.
Chem. Engng	Chemical Engineering.
Chem. Engng Progr.	Chemical Engineering Progress.
Chim. anal.	Chimie Analytique.
Chim. et Industr.	Chimie et Industrie.
Colo. Sch. Min. Quart.	Colorado School of Mines Quarterly.
Combustibles (Zaragoza)	Combustibles (Zaragoza).
Corrosion	Corrosion.
Elect. Times	Electrical Times.
Elektrichestvo	Elektrichestvo.
Elektr. Stantsii	Elektrecheskie Stantsii.
Endeavour	Endeavour.
Engineer, Lond.	Engineer (London).
Engng J., Montreal	Engineering Journal, Montreal.
Erdöl u. Kohle	Erdöl und Kohle.
Fluid Handl.	Fluid Handling.
Fuel, Lond.	Fuel (London).
Gas Oil Pwr	Gas and Oil Power.
I.R.I. Trans.	I.R.I. Transactions (Institution of the Rubber Industry).
India Rubb. World	India Rubber World.
Industr. Chem. Mfr	Industrial Chemist and Chemical Manufacturer.
Industr. Engng Chem. (Industr.)	Industrial and Engineering Chemistry Industrial Edition.
Inform. Circ. U.S. Bur. Min.	Information Circular, U.S. Bureau of Mines.
Ingenieur, 's Grav.	De Ingenieur ('s Gravenhage).
Inst. Petrol. Rev.	Institute of Petroleum Review.
Inst. Spokesm. nat. Lubric. Gr. Inst.	Institute Spokesman, National Lubricating Grease Institute.
Inst. Fire Engrs Quart.	Institution of Fire Engineers Quarterly.
Instrum. Engr.	Instrument Engineer.
Izvest. Akad. Nauk. S.S.S.R., Otdel Tekh. Nauk.	Izvestia Akademii Nauk S.S.S.R.
J. appl. Mech.	Journal of Applied Mechanics.
J. appl. Phys.	Journal of Applied Physics.
J. Colloid Sci.	Journal of Colloid Science.
J. Inst. Fuel	Journal of the Institute of Fuel.
J. Inst. Petrol.	Journal of the Institute of Petroleum.
J. Oil Col. Chem. Ass.	Journal of the Oil and Colour Chemists' Association.
J. opt. Soc. Amer.	Journal of the Optical Society of America.
J. Petrol. Tech.	Journal of Petroleum Technology.
J. phys. Chem.	Journal of Physical (and Colloid) Chemistry.
J. R. Soc. Arts	Journal of the Royal Society of Arts.
J. sci. Instrum.	Journal of Scientific Instruments.
Kemija u Industriji	Kemija u Industriji.
Lubric. Engng	Lubrication Engineering.

Abbreviated Title	*Journal*
Mech. Engng, N.Y.	Mechanical Engineering (New York).
Mech. World	Mechanical World (and Metal Trades Journal and Engineering Record).
Mot. Ship.	Motor Ship.
Nafta (Krakow)	Nafta (Krakow).
Nafta (Yugoslavia)	Nafta (Yugoslavia).
Nature, Lond.	Nature (London).
Oil Gas J.	Oil and Gas Journal.
Paint Tech.	Paint Technology.
Petroleum, Lond.	Petroleum (London).
Petrol. Engr	Petroleum Engineer.
Petrol. Process.	Petroleum Processing.
Petrol. Refin.	Petroleum Refiner.
Petrol. Times	Petroleum Times.
Pipe Line News	Pipe Line News.
Proc. Instn Mech. Engrs Lond.	Proceedings of the Institution of Mechanical Engineers.
Proc. Third World Petrol. Congr.	Proceedings of the Third World Petroleum Congress.
Publ. Rds. Wash.	Public Roads (Washington).
Rep. Invest. U.S. Bur. Min.	Report of Investigations, U.S. Bureau of Mines, Washington.
Rev. sci. Instrum.	Review of Scientific Instruments.
Rev. gén. Élect.	Revue Générale de l'Électricité.
Rev. Inst. franç. Pétrole.	Revue de l'Institut française du Pétrole et Annales des Combustibles Liquides.
Rev. Petrolière	Revue Petrolière.
Riv. Combust.	Rivista dei Combustibili.
Rds & Str.	Roads and Streets.
S.A.E. quart. Trans.	S.A.E. Quarterly Transactions.
Schweiz Arch. Angew. Wiss.	Schweizer Archiv für Angewandte Wissenschaft und Technik.
Sci. Lubric.	Scientific Lubrication.
Soap, N.Y.	Soap (and Sanitary Chemicals).
Times Rev. Ind.	Times Review of Industry.
Trans. Inst. mar. Engrs	Transactions of the Institute of Marine Engineers.
Ugol	Ugol, Moscow.
Vacuum	Vacuum.
World Oil	World Oil.

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Oilfield Exploration and Exploitation

Geology

1. Geomorphic evolution of continental terrace (continental shelf and slope). R. S. Dietz. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 1802.—Author approaches the problem of the continental terrace by deducing origin and development and by interpreting the topographic form in his concept that the varied and unrelated topography of many different continental terraces do actually represent various stages in a geomorphic cycle.

The Davisian concept of youth, maturity, and old age accounts for much of the variation in the present form of continental terraces; thus, based on examination of terrace profiles obtained from fathograms, it has been discovered that much of the terrace around the Pacific Ocean is believed to be in youth, around the eastern U.S. in maturity, and that off the Mackenzie Sea sector of Antarctica in old age. The Gulf Coast terrace off Texas may have been rejuvenated from late maturity.

Control of the continental terrace sedimentation should be by depth breaker formation topography and sea-level; wave base is not important. The inside of the surf zone, and the deep sea floor along the base of the slope are important zones of sedimentation.

The shelf and slope, with the exception of topographic lows, should accumulate large amounts of clastic sediment, and there should be no tendency for sediments to decrease in grain size seaward across the shelf.

The hinter surf beds should be made up of the sedimentary strata capping some of the continental terraces, and, due to the overloading of crust at the foot of the slope, should be preserved. These beds should end as littoral facies deposits, not having been truncated by a fault at the shelf margin nor having become forest beds.

Algal-coral reefs commonly provide topographic traps where clastic sediments collect; they also cause limestone deposition on the shelf.

These are some of the sedimentation consequences which can be tested in the field should the proposed geomorphic evolution process be correct. E. N. T.

2. Radioactive oil survey technique. J. W. Merritt. *World Oil*, 1.7.52, **135** (1), 78.—In the geochemical method of oil survey it has been found that, where excess gas movement was indicated on the ground, there was excess water evaporation leading to an excess of inorganic salts in the form of a halo above the oil accumulation. The new radioactive technique is used to detect radioactive salts in this halo, and instruments have been designed to have a sensitivity several thousand times that of the average Geiger counter.

Normally a band of high radioactivity will be expected around the margin of the hydrocarbon accumulation, and if there are multiple pays, each pay will be marked by its own high value band. In lenticular areas the determination of the distribution of hydrocarbons from the surface radioactivity pattern may be very difficult.

Precautions necessary in using this technique are outlined. C. A. F.

3. Exploratory drilling increased during May. Anon. *World Oil*, 1.7.52, **135** (1), 88.—936 exploratory wells were completed in the U.S.A. in May 1952, sixty-one more than in the previous month.

4301 exploratory wells were drilled in the U.S.A. in the first five months of 1952, 13·5% more than in the same period of the previous year; of these, 848 found commercial production.

Tables show the results of exploratory drilling in the U.S.A. in May 1952 and first five months, 1952–51, by districts, and a summary of the results of exploratory drilling. C. A. F.

4. Reef pools sought in Illinois. D. A. Morgan. *World Oil*, 1.7.52, **135** (1), 84.—The discovery during 1951 of the Tilden, Frogtown, New Memphis, Okawville, and Beaucoup reef fields in Illinois has encouraged the search for additional reef fields in the southwestern part of the Illinois Basin. The fields in this area produce from the Devonian–Silurian, and the reefs may be single or occur in groups.

The Tilden field, discovered by Carl Easdale 1, was completed for 100 b.d.; later wells have a higher initial potential, and No. 5 found 58 ft of saturated reef. The Frogtown field was discovered by Frank Warnecke 1; production is from approx 2200 ft. The New Memphis field was discovered by Oelze 1, and two wells have been completed so far. Pay is at approx 2000 ft.

There is small production from the Okawville and Beaucoup fields; very steep dips were found on the eastern edge of the Okawville pool.

Shallow reefs in Illinois can probably best be located by geophysical surveys.

C. A. F.

5. Lithologic character of Chester rocks in Illinois–Kentucky fluorspar district. A. H. Sutton and W. A. Oesterling. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 1777.—The Chester series of late Mississippian age is composed of alternating sandstone and limestone–shale units, each of which has commonly been considered a formation. Many of the clastic Chester sediments are of continental origin, the marine parts being deposited in relatively shallow water.

In this paper the authors describe various formations in this series:—

The Renault formation is made up of basal and upper limestone and overlying shale ranges between 40 and 137 ft thick, the thickest sections occupying a triangular area with its apices at the Beard, Skelton, and Royal properties.

The Bethel sandstone varies in thickness between 55 and 105 ft, and has less shale than the other Chester strata.

The Paint Creek formation ranging from 0 to 63 ft is one of the most variable in this series, being almost entirely interbedded thin shale and sandstone layers in the northern and western areas, whilst in the southeast the most conspicuous lithologic change is the increase in calcareous sediments, especially limestone.

The Cypress sandstone, 70 to 125 ft thick, is similar to the Bethel except for a greater amount of shale in the southern and southeastern parts of the district.

The Hardinsburg is a quartz sandstone, and ranges from 68 to approx 140 ft thick, with shales being generally in the middle and upper parts.

The Glen Dean formation is 45 to 75 ft thick, and very similar to the Golconda formation, being made up of interbedded shales, but generally having purer limestones than other of the Chester formations, the thickest area being in the south central part of the district.

The upper Chester formation has yielded considerably less information after drilling, and consists in the main of interbedded limestones, or sandstones and shale.

E. N. T.

6. Dolomite field produces from 12,000 ft. J. Menneer. *Petrol. Engr*, July 1952, **24** (7), B7.—Oil has been found in Devonian dolomite in the Breedlove area in Martin County, West Texas. The discovery, Breedlove 1, completed in July 1951, found 40 ft of porous dolomite which was perforated for production from 12,078 to 12,118 ft; on a 6-hr test the well flowed at 2341 b.d. Bottomhole pressure was 5570 p.s.i. and oil–water level was at 12,172 ft. A second well was completed for production in Jan. 1952.

The area was previously surveyed in detail by seismic reflection, and the discovery was sited on a prominent crest. The Spraberry which occurs at 8050 ft may prove to be also productive. Additional wells are being drilled on 80-acre spacing.

The stratigraphy of the area is briefly outlined, and drilling problems are described.

C. A. F.

7. Geology of the Spraberry trend of the Permian Basin of West Texas. J. H. Bartley. *Petrol. Engr*, July 1952, **24** (7), B37.—The Midland Basin Spraberry sand in the Permian Basin of West Texas, known as the "Spraberry trend" trends northeast for 128 miles, and varies in width from 40 to 60 miles. At March 1952, 12,223 wells were producing from the sand from twenty areas; total current monthly production was then approx 2,250,000 brl. 93% of the known extent of the sand is undrilled.

Oil was first produced from the sand by 2-B Lee in Dawson County in Jan. 1949, and subsequent development has been rapid.

Over most of the Midland Basin the Spraberry is 1000 ft thick, the topmost 200 to 250 ft and the lowermost 400 to 500 ft being productive. The upper section contains three main sands, and the lower, four. To the northwest, north, east, and southeast the sand facies grades to limestones.

Oil accumulation in the sands is associated with broad, regional, westward-plunging monoclinal noses which have a max closure of 30 ft, with the exception of the Benedum Spraberry field, which has 195 ft above a faulted anticline, and the Spraberry deep field, 300 ft above a Pennsylvanian reef.

Pays range in depth from 5300 to 8000 ft, and many of the developed areas produce from both sections of the Spraberry.

Production is largely controlled by a vertical and closely spaced fracture pattern in the sands, due apparently to downwarping in conjunction with compaction. Fracturing is less evident in the northern half of the trend.

Water tables are obscure; some areas are under a water drive, but present data indicate that most of the areas contain depletion-type reservoirs.

A structure map of the Spraberry is included. C. A. F.

8. Deep producing record made in West Texas. Anon. *Petrol. Engr*, July 1952, **24** (7), B76.—University of Texas 1, in northeastern Andrews County, has been completed for production from the Ellenburger from 13,840 to 13,884 ft; total depth is 13,198 ft, and initial production was 553 b.d. of 44·7° oil.

There was also in this well a small oil show in the Spraberry, a slight gas show above the Devonian, and a test of the Devonian, topped at 12,552 ft, found 240,000 cu. ft. gas/day.

This is the deepest producer in West Texas. C. A. F.

9. San Juan Basin gets largest well to date. Anon. *Petrol. Engr*, July 1952, **24** (7), B93.—1 Doswell, Ria Arriba County, New Mexico, on test of the Tocito at approx 6700 ft produced 697·15 brl of 42° oil in 10 hr. The well is about 57 miles southeast of Farmington.

36 miles to the east of 1 Doswell a wildcat found 50 b.d. of crude. C. A. F.

10. Odd geologic structures of Southern Oklahoma. C. W. Tomlinson. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 1820.—Describes some of the unusual structures found as a result of regional crust compression in the Ardmore district of Oklahoma. The most striking of these types is the pseudo-plastic folding with extensive axial thickening of major shale sections found in the Caddo and Overbrook anticlines.

The Fox Graham and Velma oil pools are of the "rabbit ears" anticlinoria type, in which lateral anticlines paralleling the central arch overlie truncated shales dipping away from the central fold.

Faulting has also produced some extraordinary structural features in Southern Oklahoma, as, for example, the hinge faults along which stratigraphic displacement varies in a very short distance found in Cedar Canyon; the Criner fault—normal along part of its length and reverse at another part; the Washita Valley "propellor" fault zone, warped into thrust position in opposite directions along different parts of its trace; and finally, the horst-graben fault blocks of the Woodford and Crusher areas. E. N. T.

11. Shell well at 10,300 ft. Anon. *Petrol. Engr*, July 1952, **24** (7), B96.—2 Fender "D," Beckham County, Oklahoma, on test flowed 18 brl of 49·7° oil in 15 min, from 10,238 to 10,300 ft. G.O.R. was 2370 : 1. 780 ft oil and 30 ft oil and gas-cut mud were recovered. C. A. F.

12. Carter well flowing from deep zone in Mayfield pool. Anon. *Petrol. Engr*, July 1952, **24** (7), B96.—1 Atwood in the Mayfield pool, Beckham County, Oklahoma, on test flowed 785 brl of fluid in 23 hr from below the liner set at 12,768 ft; gas vol was 6,668,000 cu. ft/day. C. A. F.

13. Marine origin of Preuss sandstone of Idaho, Wyoming, and Utah. R. W. Imlay. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 1735.—It has recently been discovered that the Preuss sandstone was essentially of marine origin and probably graded westward into marine limestones. The Preuss sandstone was formed during part of the upper Callovian, and about the same time as the redbeds at the base of the Upper Jurassic in the Gulf region of the United States and Mexico.

In middle Callovian time, a series of highly saline lagoons bordered a large island in the Montana area which nearly severed the southern part of the sea from the marine waters of Canada. The Preuss sandstone was formed from the iron oxide and sands produced from the lateritic soils developed on the island, and redbeds formed in the sea along the southern and eastern margins similar to this sandstone.

It has been inferred that this island had a warm and seasonally humid climate. E. N. T.

14. Stratigraphic details of Lower Mississippian rocks of northeastern Utah and southwestern Montana. F. D. Holland, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 1697.—Renewed interest has recently become apparent in the study of the Mississipian rocks of the U.S. Rocky Mountain region. A detailed stratigraphic restudy is given of the lower part of the Madison group, and a section measured, bed by bed, of the Madison Limestone near Logan, Utah, compared with the type section in Montana.

A new formation underlying the Madison in northeastern Utah is compared with the Sappington sandstone underlying this group at the type section. The Sappington and the new unit appear to be contemporaneous formations, both on a lithologic and faunal basis.

The Lodgepole limestone, the lowermost formation of the Madison group, consists of dark grey, hard, very fine-crystalline limestones rhythmically interbedded with softer light grey to yellowish grey argillaceous limestone or shale, its fauna showing it to be a Kinderhookian formation, of which the Sappington is also a member.

In northeastern Utah, fossils were discovered at the top of a prominent limestone ledge, previously believed to have marked the base of the Madison. This ledge carries the same *Syringothyris* fauna as the Sappington sandstone of Montana, and is made up of a series of sandy shales and nodular limestones attributed to the Jefferson formation of the Devonian.

Apparently there are no beds equivalent to the Mission Canyon limestone of Montana in the Utah section, and the similarity of the lithology combined with faunal similarities show that the Madison in this area is entirely of Lodgepole age. E. N. T.

15. Origin of Crow Creek member of Pierre shale in central south Dakota. D. R. Crandell. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 1754.—The Late Cretaceous Pierre shale of central south Dakota, of which the Crow Creek formation is a member, consists of a layer of sandy siltstone 1 ft thick and an overlying marl approx. 10 ft deep. This coarser and more calcareous unit is believed to have resulted from an uplifting and reworking of earlier Cretaceous sediments which were deposited on the sea floor in the east-central part of the state, thus accounting for the difference in the formations of central south Dakota which consist, in the main, of shale and claystone. E. N. T.

16. Lower Cretaceous in Colorado Plateau. W. L. Stokes. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 1766.—Cedar Mountain and Burro Canyon formations of the Colorado Plateau have recently contributed fossil collections made up of non-marine microfossils, plants, and molluscs. This collection makes it possible to give a more satisfactory age assignment to several previously proposed formations which were originally included in the Lower Cretaceous with little or no palæontologic evidence. A result of this discovery is that the Morrison formation and so-called "Dakota" can now be regarded as consisting locally of early Cretaceous sediments.

The separation is also described of the Lower Cretaceous beds by a thin conglomerate which may bridge the Jurassic–Cretaceous time plane. E. N. T.

17. Geology of the Coleville field, Saskatchewan. G. J. Hamilton. *Canad. Min. metall. Bull.*, 1952, **45**, 611–15.—Maps and charts of the Coleville field, well locations in the district, and a structure cross-section of the field are given. The geology of the Devonian, Mississippian, and Cretaceous structures are described and illustrated by structure contours and isopachs of the Exshaw, Banff, Mississippian, Blairmore, and Viking sand horizons. The Coleville two-zone oil and natural gas discovery indicates that sedimentation in this field was controlled to a remarkable extent by structure and topography. Whether these features are local or widespread is at present unknown, owing to insufficient field data. W. H. C.

18. Athabaska River area due for exploratory programme. Anon. *World Oil*, 1.7.52, **135** (1), 278.—Large-scale exploratory work is planned for the Athabaska River area of northeastern Alberta.

The Athabaska oil occurs in a sand 100 to 200 ft thick covering an area estimated at 8000 to 30,000 sq. miles. Estimated reserves range from 100 billion to 300 billion brl of recoverable oil. C. A. F.

19. Barbados Gulf spuds in its first island test. Anon. *World Oil*, 1.7.52, **135** (1), 272.—A test is being made in Barbados, following airborne magnetometer, gravity, and seismic surveys. Oil possibilities are said to be good, but potential reservoir rocks may be as deep as 10,000 to 12,000 ft.

There has been small production in the island for over fifty years. C. A. F.

20. Methane gas discovery is announced by AGIP. Anon. *World Oil*, 1.7.52, **135** (1), 278.—A well at Bordolano, near Milan, Italy, was completed for 7 million cu. ft. gas/day. Further wells are being drilled in the area.

Po Valley methane production is expected to be increased to over 425 M.c.f/day when the gasoline system has been completed. C. A. F.

21. German test finds gas. Anon. *World Oil*, 1.7.52, **135** (1), 268.—Rehden 4, near Diepholz, found high pressure gas at 5825 ft in Bunter sandstone. A second test is to be drilled. C. A. F.

22. Field discovered. Anon. *World Oil*, 1.7.52, **135** (1), 268.—A major discovery is reported from Matzen, south of Zistersdorf, Austria. New wells are said to be yielding approx 30,000 b.d.

Total Austrian production is expected to reach 12,281,400 brl in 1952. C. A. F.

23. New Pakistan pushes petroleum development. M. J. Condon. *Petrol. Engr*, July 1952, **24** (7), A40.—Four producing fields have been established in Pakistan; these are in the Potwar Basin, at Khaur, Dhulian, Balkassar, and Joya Mair. Total production is approx 3500 brl.

Exploration for new fields is being carried out; a recent test well at Lakhra in Sind was a failure. Six tests are being made at present, at Bains and Chak Naraung in Punjab, Sui in Baluchistan, and at Patharia and Sylhet in East Bengal. Sui is dry to 8200 ft, and Patharia has found only negligible production.

An aerial magnetic survey has been carried out in East Bengal as part of a plan to survey the whole of the Brahmaputra Delta. C. A. F.

Geophysics and Geochemical Prospecting

24. Applied geophysics in West Germany during the last five years. H. Closs. *Proc. Third World Petrol. Congr.*, 1951, **1**, 564–82.—Much activity in geophysical prospecting has recently taken place in Germany. Marked progress has been made in reflection seismic work, and, due to improved equipment, valuable modifications in field technique have followed. Examples are given of surveys in the Northwest German salt stock area, and from these some general conclusions are drawn. Seismic reflection

conditions are also outlined in the Emsland and in the foreland of the German Mittelgebirge—the newest oilfield area of North Germany.

In refraction seismic prospecting, the use of a modern seismograph equipment has revealed deep seated deposits, including the cover on salt structures.

Gravimetric and magnetic methods are also discussed, together with regional anomalies. In certain areas magnetic anomalies, as indications of deep structures, seem to be of greater importance than gravimetric. G. S. S.

25. Isogam maps of Caribbean Sea and surroundings, and of Southeast Asia. J. W. de Bruyn. *Proc. Third World Petrol. Congr.*, 1951, **1**, 598–612.—Four large (folded) coloured productions are presented : two isogam maps and two bathymetric charts.

The maps, which are on a scale of 1 : 10,000,000, are of the Caribbean Sea with parts of North, Central, and South America, and of Southeast Asia, including East Indian Archipelago, the Philippines, and New Guinea. They are compiled from published gravity observations and from the Royal Dutch Shell's and affiliated companies' gravity surveys. All the latter observations, and certain of the published ones, have been isostatically corrected. The Caribbean Sea map is based upon Hayford–Bowie isostatic anomalies (T 113·7 km), and the Southeast Asia map upon Vening Meinesz regional isostatic anomalies (T 25 km, R 160 km).

The charts, also on a scale of 1 : 10,000,000, have been compiled from the latest published information. Very few names of islands, seas, etc., are shown, to avoid confusing the picture, and only those not generally known but used in the text have been taken from the original charts.

The object of the work is to present, as a basis for further discussion, a general picture of the gravity field of these areas. G. S. S.

26. Ten years of application of the telluric method. L. Migaux. *Proc. Third World Petrol. Congr.*, 1951, **1**, 624–45. (In French.)—An account of the work and results obtained by the telluric method which is well known only in France and the French Colonies. Reference is made to the principles of the method, and this is followed by a comparison with other geophysical methods which are either very similar (gravimetric and seismic refraction) or very different (seismic reflection). From this comparison the advantages and limitations of the telluric method are apparent, as well as the conditions of its service. A review is given of the principal surveys carried out in parts of Europe and North Africa—Gabon, Cameroon, and Madagascar. The specific results obtained from these surveys are outlined.

It is considered that the telluric method will be of much value in solving certain problems, including those encountered in oil prospecting. G. S. S.

27. Quantitative interpretation in geophysical prospecting by the telluric method. V. Baranov. *Proc. Third World Petrol. Congr.*, 1951, **1**, 646–53. (In French.)—In discussing quantitative interpretation in geophysical prospecting by the telluric method, consideration is limited to the cylindrical or two dimensional case. By this means the problem can be resolved easily by a mathematical apparatus which appears no more complicated than that required in standard prospecting methods. Thus it is concluded, the telluric method, at first purely empirical, is provided with a more secure mathematical basis. Examples are given. G. S. S.

28. The application and interpretation of the seismic method. J. Cantos. *Proc. Third World Petrol. Congr.*, 1951, **1**, 590–7. (In French.)—A procedure regarding the employment of the seismic method of refraction is given, with an interpretation of the " dromechroniques " so obtained ; the formulæ used are also worked out. Two tests were made in the province of Jaen, Spain, on some gently folded structures of Miocene and ?Triassic age. Very satisfactory results ensued from this research, which was carried out in association with the Geophysical Section of the Spanish Geological and Mining Institute. G. S. S.

29. Reflections in the interior of salt domes and their importance in the search for oil. T. Krey and B. Helwich. *Proc. Third World Petrol. Congr.*, 1951, **1**, 583–9. (In French.)—A brief account of some surveys of salt domes in Germany in which the reflection paths have penetrated their cores. The reflector may be the interior of the

lateral or overhanging face of the dome, or the contact between two different Permian horizons, both containing salt layers and forming the dome. Determination of the position of the reflector is dependent mainly upon the dip of the upper surface of the salt, where the energy is refracted.

There are thirteen figures which occupy the major part of the paper. G. S. S.

30. Graphical evaluation of the anomalies of gravity and of the magnetic field, caused by three-dimensional bodies. F. Gassmann. *Proc. Third World Petrol. Congr.*, 1951, **1**, 613–23.—In interpreting anomalies of gravity of the terrestrial magnetic field, methods are required which will quickly evaluate the gravitational or the magnetic field of bodies of varying shape. Since limited accuracy is sufficient, graphical methods are suitable. Such a method is given, and this consists in conducting the required triple integrations by two stages, the first being a simple, the second a double integration. By the aid of graphs, the integrations are reduced to simple counting operations. G. S. S.

31. Gravity observations in a borehole. R. L. G. Gilbert. *Nature, Lond.*, 1952, **170**, 424.—The bulk densities of rock layers in a borehole can be determined at any desired level by means of a gravimeter. The theory and construction of this instrument, of dimensions 5 inches dia and 8 ft long, are briefly described. The results obtained with the instrument are compared with direct density determinations made on samples of chippings (*ca* 0·1 cm size) from the borehole. H. C. E.

32. Correlation of radioactive logs of the Lansing and Kansas City groups in Central Kansas. J. V. Morgan. *J. Petrol. Tech.*, Apr. 1952, **5** (4), *AIMME Tech. Paper No.* 3311, 111–18.—The Lansing–Kansas City groups of Central Kansas range 200 to 400 ft in thickness, and are next to the Arbuckle in areal frequency of oil production. In the main the groups are a series of limestones and shales. Oil occurs in porous streaks in the various limestones. γ-ray and neutron logs have afforded a means of correlation of this series over large areas, together with an indication of the detailed lithology. A series of units have been determined. Identification of the various zones is necessary, since only one or two zones are usually found to be commercially productive in any field, and changes in zone thickness and lithology laterally may be important factors in the accumulation of oil.

This zoning, coupled with analyses of the results of testing, may be of value in future exploration. The main features of each zone are briefly noted, together with the areas in which they are principally productive.

A map, and sections showing γ-ray–neutron log correlation, are given. G. D. H.

33. Patents. U.S.P. 2,592,780 (18.6.47; 15.4.52). J. P. Woods, assr to The Atlantic Refining Co. Underwater drag seismometer.

U.S.P. 2,593,052 (17.5.48; 15.4.52). R. G. Piety and M. E. Thomas, assrs to Phillips Petroleum Co. Seismometer.

U.S.P. 2,594,219 (21.12.49; 22.4.52). W. Roth and J. Ohman, assrs to Geovision Inc. Electronic geophysical display apparatus.

U.S.P. 2,594,429 (17.10.49; 29.4.52). E. J. Handley, assr to Century Geophysical Corpn. Pipe-lifting device.

U.S.P. 2,594,767 (1.11.43; 29.4.52). R. P. Green, assr to Engineering Laboratories Inc. Seismic surveying.

U.S.P. 2,595,092 (19.5.47; 29.4.52). W. D. Mounce, assr to Standard Oil Development Co. Underwater gravitational surveying apparatus. R. C. R.

U.S.P. 2,598,697–8 (2.7.46; 3.6.52). H. Jensen. Method of geophysical surveying using an aircraft with associated magnetometer apparatus.

U.S.P. 2,599,063 (22.7.46; 3.6.52). J. P. Minton, assr to Socony-Vacuum Oil Co. Inc. Seismic prospecting system.

U.S.P. 2,599,245 (27.6.47; 3.6.52). R. S. Finn, assr to Seismograph Service Corpn. Method of generating seismic waves beneath water while preventing generation of non-primary waves which involves detonating an auxiliary explosive charge between

the surface of the water and the main charge, to open a gas escape path for the exploding main charge.

U.S.P. 2,599,775 (1.7.48; 10.6.52). G. Peterson, assr to Phillips Petroleum Co. Electrostatic seismometer.

U.S.P. 2,600,051 (20.12.49; 10.6.52). C. H. Fay and T. V. Tvedt, assrs to Shell Development Co. Seismograph amplifier control.

U.S.P. 2,601,522 (28.2.46; 24.6.52). C. A. Heiland and M. T. Murray. Method of seismic prospecting in which the explosive charge is so placed in the earth that the beam of explosive energy is directed at an angle substantially equal to that of the critical refraction ray of an underlying earth formation. J. M. S.

Drilling

34. Oilfield scouting. E. T. Hall. *Canad. Min. metall. Bull.*, 1952, **45**, 550–1.—The evolution and historical aspects of oil scouting are outlined, and the attributes and qualities requisite in an oil scout, his work, and responsibilities towards his employers, are discussed. The formation of the National Oil Scouts and Landsmen's Association, in Mineral Wells, Texas, and of the Western Canada Oil Scouts' Association, and their aims, activities, developments, and members' periodic change of districts, are described. W. H. C.

35. Actual ways of reducing own costs of drilling in petroleum industry. J. Pawlowski. *Nafta* (*Krakow*), 1951, **7**, 321–3.—Technical and administrative planning closely linked with local geological conditions forms the basis of such reduction. Use of mass produced, simply designed bits; use of case hardened bits to extend their life; economy in use of pipes; uniformity of equipment; these will contribute to the completion of the six year plan before 1955. Change over from percussion to rotary method should embrace three-quarters of all work by then. M. S.

36. Activities of drilling establishment. Anon. *Bull. Main Petrol. Inst.*, **5** (1), Suppl. to *Nafta* (*Krakow*), 1951, **7**, 22.—Brief notes on hydraulic drill operated by mud (S.G. 1·18) and on labour productivity standards. M. S.

37. Influence of Soviet science and technique on progress in Polish petroleum drilling. W. Kulczycki. *Nafta* (*Krakow*), 1951, **7**, 290–3.—Soviet methods of approach are more suitable than American for underdeveloped industry. Extensive bibliography included in text. M. S.

38. Science and technique in Soviet Union (Monthly review). Transportation of derricks without dismantling. L. Tomaszkiewicz. *Nafta* (*Karkow*), 1951, **7**, 317–18. (*Based on "Petrol Si Gase" No.* 2, 1950.)—This urgent matter has been subject of several experiments in the U.S.S.R. and Roumania. Derrick may be removed on rollers or slides using one or several tractors. Mechanism may or may not be moved separately. A record transfer was achieved by the crew which moved a derrick 41 m high over 24 km in 6 hr up a slope of 6° to 15°. In Roumania three tractors are commonly used, in the U.S.S.R. sometimes as many as eight. M. S.

39. Problem of electrification of rotary drilling units. W. Kobylinski. *Nafta* (*Krakow*), 1951, **7**, 308–11, 323–8.—Electrical drilling is most economical and in step with introduction of electricity into most remote parts. The six-year plan includes electrification of some 30% of drilling units. Author considers power requirements of different parts of the machinery and the characteristics of different motors, expressing himself in favour of motor-tool units, *e.g.*, electric motor built into rotary table, the "electro-vert" type of drill, etc. However, application of electric power to existing units will be best achieved using diesel-electric motors according to Soviet example.
References to Soviet technical literature. M. S.

40. Patents. U.S.P. 2,592,947 (3.7.46; 15.4.52). J. S. Page, assr to Page Oil Tools Inc. A tubing packer for operation in a well casing.

U.S.P. 2,593,520 (11.10.45; 22.4. 52). R. C. Baker and B. Kriegel, assrs to Baker Oil Tools Inc. Well cementing apparatus.

U.S.P. 2,593,532 (13.6.46; 22.4.52). H. P. Burrell. Rock drill.

U.S.P. 2,593,725 (22.4.46; 22.4.52). C. C. Brown. Tool for repairing damaged well casing by extending the portion of a cut casing which remains in the well bore.

U.S.P. 2,594,029 (31.7.48; 22.4.52). C. F. Johnson, assr to Eastman Oil Well Survey Co. Reading device for core-orienting equipment.

U.S.P. 2,594,105 (14.5.48; 22.4.52). R. G. Watts, assr to Socony-Vacuum Oil Co. Inc. System for gathering and loading oil from an underwater oil well.

U.S.P. 2,594,292 (7.3.49; 29.4.52). P. D. Cornelius, assr to Byron Jackson Co. Side wall sampler for bore holes.

U.S.P. 2,594,550 (15.3.50; 29.4.52). F. M. Gist. Multi-section pipe protector comprising a plurality of lengths of centralizers annularly spaced on the well pipe and arranged in longitudinally adjacent series.

U.S.P. 2,594,551 (15.3.50; 29.4.52). F. M. Gist. Well pipe centralizer and attachment therefor.

U.S.P. 2,594,617 (13.2.46; 29.4.52). E. G. Boice, assr to Reed Roller Bit Co. Laminated drill collar.

U.S.P. 2,594,654 (26.2.48; 29.4.52). J. R. Jobe. Pipe cutting tool.

U.S.P. 2,594,831 (12.11.47; 29.4.52). R. O. Walton, assr to Merla Tool Corpn. Well flow device.

U.S.P. 2,594,847 (29.12.47; 29.4.52). W. F. Bates, J. N. Gregory, and C. S. Penfield, assrs to Shell Development Co. Drilling rig substructure.

U.S.P. 2,595,008 (20.10.48; 29.4.52). W. R. Sill. Tool for extracting a broken pipe from a well.

U.S.P. 2,595,014 (28.11.49; 29.4.52). L. W. Smith. Hydrostatic pulling tool for operation with and below a tubular string employed in well bores.

U.S.P. 2,595,018 (31.8.50; 29.4.52). W. A. Stokesbary, assr to Shell Development Co. Drilling sub for sidewall samplers.

U.S.P. 2,595,025 (23.8.47; 29.4.52). J. C. Tripplehorn. Spiralled paraffin remover adapted to engage a sucker rod within a well tubing.

U.S.P. 2,595,084 (16.9.47; 29.4.52). M. W. Kriegel, assr to Standard Oil Development Co. Fluid sampler for well bores.

U.S.P. 2,595,126 (18.6.49; 29.4.52). O. A. Causey, assr to L. East. Well drilling machine.

U.S.P. 2,595,107 (19.3.48; 29.4.52). B. W. Sewell, assr to Standard Oil Development Co. Drilling apparatus.

U.S.P. 2,595,184 (31.10.46; 29.4.52). G. G. Wrightsman, assr to Standard Oil Development Co. Consolidating or plugging sand by treating with a liquid comprising formaldehyde, an unsubstituted hydroxy aromatic compound and 2 to 10%, by weight, of a strongly alkaline catalyst. R. C. R.

U.S.P. 2,598,675 (28.11.49; 3.6.52). H. G. Cutforth, assr to Phillips Petroleum Co. Low water-loss cement slurry for cementing wells comprising a hydraulic cement mixed with 2-hydroxy-Δ3-butenyl ether of cellulose.

U.S.P. 2,598,827 (3.9.46; 3.6.52). J. R. Pettigrove, assr to Phillips Petroleum Co. Device for recording density of drilling mud.

U.S.P. 2,599,039 (27.10.47; 3.6.52). J. F. Baker. Rotatable tubing hanger.

U.S.P. 2,599,040 (8.11.47; 3.6.52). C. E. Bannister. Sample taking and casing perforating apparatus.

U.S.P. 2,599,041 (20.11.47; 3.6.52). C. E. Bannister. Apparatus for enlarging and straightening previously drilled well holes.

U.S.P. 2,599,060 (9.2.51; 3.6.52). A. W. Kammerer. Expansible rotary drill bit.

U.S.P. 2,599,112 (7.10.47; 3.6.52). W. F. Krueger, assr to Sperry Sun-Well Surveying Co. Apparatus for determining the time of descent of well surveying instruments within boreholes.

U.S.P. 2,599,342 (1.3.50; 3.6.52). V. G. Meadors, assr to Standard Oil Development Co. Drilling fluid comprising an aqueous dispersion of a clay containing piperidine or a homologue thereof or an aliphatic or *cyclo*aliphatic amine.

U.S.P. 2,599,413 (18.1.50; 3.6.52). P. P. Reichertz, assr to Socony-Vacuum Oil Co. Inc. Drilling mud resistivity meter.

U.S.P. 2,599,687 (Canada 10.11.48; 10.6.52). A. A. Brant, assr to Geophysical Exploration Co. Drill hole magnetometer apparatus.

U.S.P. 2,599,745 (23.6.49; 10.6.52). J. G. Campbell and H. L. Twining. Composition for sealing permeable formations encountered in well drilling, comprises fibrous material of jute, flax, mohair, lechuguilla, synthetic fibres, cotton, cotton linters, wool, or wool shoddy mixed with sawdust.

U.S.P. 2,599,752 (3.2.49; 10.6.52). P. W. Fischer, assr to Union Oil Co. of California. Drilling fluid consisting of a mineral oil base, 1 to 10 wt % of a solid water-soluble alkaline earth metal salt and 0·2 to 10 wt % of an oil-soluble metal soap dispersing agent.

U.S.P. 2,599,854 (10.12.49; 10.6.52). P. A. McMurdy and O. N. Donehoo. Well drilling bit.

U.S.P. 2,600,125 (13.12.48; 10.6.52). M. L. Natland and R. E. Pearson, assrs to Richfield Oil Corpn. Punch core orientator for wells.

U.S.P. 2,600,173 (26.10.49; 10.6.52). B. W. Sewell and G. H. Ramsey, assrs to Standard Oil Development Co. Formation tester.

U.S.P. 2,600,195 (31.3.48; 10.6.52). D. C. Bond, assr to The Pure Oil Co. Fissures occurring during well drilling are sealed by carrying into the well different sized tough rubbery parboiled macroscopic balls of flour dough and applying sufficient pressure to deposit the dough balls in the fissures.

U.S.P. 2,600,336 (2.11.50; 10.6.52). H. R. Scivally. Well logging apparatus.

U.S.P. 2,600,404 (13.7.48; 17.6.52). R. W. Hoeppel, assr to National Lead Co. Degradation of starch in aqueous clay-laden starchy drilling fluids is prevented by pretreating the ungelatinized starch with a brine having a concentration of at least 16%.

U.S.P. 2,600,468 (16.7.48; 17.6.52). N. T. Breaux. Packer assembly for wells.

U.S.P. 2,600,761 (6.12.48; 17.6.52). E. P. Halliburton. Offshore drilling barge fitted with extendable legs.

U.S.P. 2,601,050 (15.9.48; 17.6.52). A. C. Nestle, assr to Texaco Development Corpn. Aqueous drilling fluid containing ± 17 vol % mineral oil and ± 3 lb per brl of drilling fluid of finely divided cork, or bark powder.

U.S.P. 2,601,122 (29.3.47; 17.6.52). B. R. McKinley. Formation tester and pipe perforator. J. M. S.

Production

41. Gas test is scheduled. Anon. *World Oil*, 1.7.52, **135** (1), 278.—Frenswegen 1, near Nordhorn, Germany, is to be tested for optimum gas production and gas composition, to determine whether the gas can be used for repressuring in the Georgsdorf field. C. A. F.

42. Science and technique in Soviet Union. Maintenance of formation energy a condition of rational exploitation in U.S.S.R. Anon. *Nafta (Krakow)*, 1951, **7**, 318–19.—Exploitation is carried out by pumping in water as crude is removed. River water is purified before use. M. S.

43. Compressed gas pumping units for petroleum exploitation. Z. Wilk. *Nafta (Krakow)*, 1951, **7**, 306–8.—Instead of complex mechanical pumps in use at present,

simple gaslift or compressed gas pumping units could be employed. The latter are more economical. With 3 to 10 m/sec oil flow a column of crude of 60 m length would rise 500 m in 1 to 2 min propelled by gas at 7 atm pressure. Large compression chambers, say, of 100 litres vol need be emptied only twice a day. M. S.

44. Equilibrium vaporization ratios for nitrogen, methane, carbon dioxide, ethane, and hydrogen sulphide in absorber oil–natural gas and crude oil–natural gas systems. R. H. Jacoby and M. J. Rzasa. *J. Petrol. Tech.*, Apr. 1952, **5** (4), *AIMME Tech. Paper No.* 3312, 99–110.—Experimental equilibrium vaporization ratios (K values) were determined for nitrogen, methane, carbon dioxide, ethane, and hydrogen sulphide in two natural gas–absorber oil mixtures and in two natural gas–Elk Basin crude oil mixtures. The pressure cell used is described in detail, together with the experimental technique. For each mixture of constant overall composition data were obtained at 100°, 150°, and 200° F, and at pressures in the range 200 to 5000 p.s.i.a. Tables give analyses of the materials used, the overall compositions of the mixtures studied, and equilibrium flash vaporization data for the mixtures, as well as the experimental data for the various mixtures. The various K values are displayed graphically. Some comparisons are made with previously published data.

In certain temp ranges the nitrogen K's decreased with increasing temp. For a very narrow range of temp and pressure in two mixtures methane showed a similar behaviour.

It is believed that the data will apply with little error to mixtures having concentrations of the non-hydrocarbons within 5 mol % of those in the experimental mixtures. G. D. H.

45. Simplified method for computing oil recovery by gas or water drive. H. J. Welge. *J. Petrol. Tech.*, Apr. 1952, **5** (4), *AIMME Tech. Paper No.* 3309, 91–8.—The approach adopted in calculating the oil recovery by gas or water drive assumes a linear sand section, oil displacement by an immiscible phase, and in the case of gas drive pressure sufficiently constant geographically and in time so that changes in gas density, solubility, and reservoir volume factor are negligible. Relative permeabilities are required only for a limited and intermediate saturation range. The fundamental relationships derived by Buckley and Leverett are employed, but the term involving capillary pressure gradient is dropped. The relationships are dependent on the application of Darcy's Law to the flowing phases, and on material balance considerations. The present technique is dependent on calculating the average saturation, and hence the oil recovery. This simplifies the computations, since it eliminates numerical integrations, and even saturation distribution plots are not needed.

The theory of the method is outlined, and an illustrative example with gas drive is worked out. The application of the method to water flooding or water drive is outlined, and suggestions are made for the case of gas drive following an initial period of declining pressure. G. D. H.

46. Petroleum-engineering study of gas injection in the Cabin Creek field, Kanawha and Boone Counties, W. Va. J. N. Magee and S. S. Taylor. *Rept. Invest. U.S. Bur. Min.* 4899, Aug. 1952, 24 pp.—Cabin Creek field is about 20 miles southeast of Charleston, and lies on the southeast slope of the Warfield anticline. The part of the field on which operations were conducted is known as Project 4, and a map is supplied showing the location of the gas-injection wells.

The oil-bearing formation is the Berea sandstone, the reservoir itself occurring at approx 2900 to 3400 ft. The first well completed was in 1917, and from that year to 1942, seventy-five wells were completed and placed in operation.

Gas injection began in 1935, and development continued until 1942. From the beginning of 1945, operations were altered considerably. In this report, production–decline-curve extrapolations are based upon all production data from 1917 to 1944. A study of the operations shows that injection of gas has resulted in the recovery of 1,660,000 brl of additional oil over that produced by primary-recovery methods. A number of illustrations accompany the report, including various isogram maps, graphs, and production tables. G. S. S.

47. A reservoir study of the Excelsior pool. W. A. Bain. *Canad. Min. metall. Bull.*, 1952, **45**, 536–41.—Production from the Excelsior reservoir, Alberta, Canada, has amounted to approx 1 million brl. This production has caused a pressure drop of 10 p.s.i. from the original pressure of 1245 p.s.i.g. It is shown that: (1) the oil is produced by a water-drive that is probably unsurpassed in Western Canada; (2) the reservoir pressure will still be above the saturation pressure of 915 p.s.i.g. at the time of depletion. The average permeability of the formation is approx 1000 mD, and consequently well draw-downs are very low. Core data have placed the flushing efficiency at approx 50%, which indicates a recoverable oil-in-place of 17·7 million brl. The MER for the early life of this field is probably as high as 8000 to 10,000 b.d.

W. H. C.

48. Control of formation water closure by use of dyes. W. Chajec. *Nafta (Krakow)*, 1951, **7**, 301–5.—To make sure that formation water closure has been effective, the use of a dye is very helpful. The dye must stand great dilution and resist destruction due to various salts. Fluorescene ($C_{20}H_{12}O_5$) and eosine (tetrabromo fluorescene—$C_{20}H_8Br_4O_5$) are very suitable, since they are well visible in solution of *ca* 10^{-6} molar concn in slightly alkaline water. They also resist decomposition by salt water, mud, and filtration, but crude oil affects such dilute solution and 10^{-5} mol/mol must be employed.

In practice an injection of 10 g of fluorescene enabled identification of two streams of water 500 m below the ground. The dye in the sample persists for years.

Faulty closure was detected in 17% of cases. Geological application of this method promises to be great.

Exact procedure is described. M. S.

49. Patents. U.S.P. 2,598,932 (9.6.45; 3.6.52). P. J. Natho, assr to Pan American Production Co. Well pressure gauge.

U.S.P. 2,598,988 (1.5.48; 3.6.52). C. O. Glasgow, assr to National Tank Co. Oil well emulsions are passed through hot water, elevated in a segregated path through bodies of water and oil into a segregated zone wherein gas is released, carried downward through a degassing zone, and conducted in a segregated path downwardly through water (at a lower temp than the first water wash) from which the oil is separated.

U.S.P. 2,599,386 (15.7.46; 3.6.52). J. D. Haynes, assr to The Dow Chemical Co. Well treating apparatus for spotting a fluid material in a well.

U.S.P. 2,599,405 (10.9.47; 3.6.52). M. Mennecier, assr to Schlumberger Well Surveying Corpn. Sample taking apparatus for use in bore holes.

U.S.P. 2,599,458 (19.10.49; 3.6.52). E. W. Jones and L. E. Gray. Flow controller for a series of wells comprising means for metering in predetermined measures the fluid from the wells, control means for releasing desired amounts of fluid from each well, and a variable reduction drive connecting the metering and control means.

U.S.P. 2,599,538 (20.7.51; 10.6.52). C. M. Blaire, assr to Petrolite Corpn Ltd. Water-in-oil emulsions are broken by means of an organic polyester derived from an aliphatic glycol having >6 carbon atoms and a dicarboxylic acid having <8 carbon atoms, the ratio of glycol to acid residues being in the range 0·5 : 1 to 2·0 : 1.

U.S.P. 2,599,583 (15.11.46; 10.6.52). R. A. Robinson and W. F. Eberz, assrs to Petrolite Corpn Ltd. Method and apparatus for testing water-in-oil dispersions.

U.S.P. 2,600,150 (9.11.50; 10.6.52). G. F. Abendroth, assr to Standard Oil Development Co. Borehole screen for oil wells. J. M. S.

Oilfield Development

50. Exploratory activity in the Permian Basin. H. L. Swords. *Petrol. Engr*, July 1952, **24** (7), B50.—Recent exploratory activity in the Permian Basin of West Texas–New Mexico is briefly reviewed, and data are given on new fields and extensions in West Texas and New Mexico for the period Jan. to May 1952. C. A. F.

51. The Acheson field. E. E. Cody. *Canad. Min. metall. Bull.*, 1952, **45**, 545–9.—A description is given of the activities and results obtained by the California Standard Co., the Imperial Oil Co., and others in the Acheson field, Alberta, Canada. The area is immediately west of Edmonton, and in line with the Leduc reef trend. The potential producing horizons are described, and data are given of the D3 reef reservoir, the D3 reservoir fluid, and the D3 reservoir mechanics. The crude has an API gravity of 36·6, a sulphur content of 0·26%, salt content averaging about 5 lb/1000 brl, pour point of −10° F, and contains about 3% wax. California Standard Co.'s cumulative production to end of Aug. 1951 was 396,581 brl from twenty wells, representing over 95% of total output of the twenty-four wells producing in the field. Drilling problems and costs, production problems, and recovery methods are described.

W. H. C.

52. Foreign production and development during 1951. E. W. Berlin, A. H. Chapman, *et al. J. Petrol. Tech.*, Apr. 1952, **5** (4), 11–16.—During 1951 leases in Western Canada increased by 39,000,000 acres to about 168,000,000 acres. There was leasing activity in Saskatchewan and Manitoba, as well as in northwest Alberta, British Columbia, and the Northwest Territories. Discoveries at Fort St John and in the Williston Basin encouraged this leasing. There was an average of 153 geophysical parties in the field, the work aggregating 1630 party-months.

478 wildcats were drilled in Western Canada, giving sixty-eight oil discoveries or extensions and seventy-eight gas discoveries or extensions. The discoveries were in formations ranging Devonian to Cretaceous in age. The Texas Wizard Lake well was probably the most important find, with oil in the Viking, Lower Cretaceous, D2 and D3. 754 oil wells were completed. Output in Western Canada reached 130,000 b.d. At the end of the year reserves were estimated at 1,300,000,000 brl.

Seismic work continued in Brazil, and several dry tests were drilled. The 1951 output was about 700,000 brl. Chile has eight fields in Tierra del Fuego, with fifty wells. The Colombian output averaged 105,000 b.d. The De Mares concession expired. Ortega No. 1 opened a new field in the Upper Magdelena Valley, 10 miles north of the Tetuan field. In all three successful wildcats were drilled in 1951. Ecuador's output averaged 7400 b.d., and remaining reserves are placed at 25,000,000 brl. In Mexico the output was about 210,000 b.d., while reserves are given as 1,400,000,000 brl. Three new fields were discovered on the isthmus, and two new producing areas in the northeast. Peru's production was 44,300 b.d., with reserves estimated at 170,000,000 brl. Geophysical work is proceeding in Uruguay. In 1951 Venezuela's output averaged 1,698,000 b.d., an increase of 200,000 b.d. over 1950. A gas line was laid to the Placer area.

Western Germany produced 28,000 b.d., mainly from the Jurassic and Cretaceous in the northwest. Encouraging shows were found in a well at Hemmelte, in the Jurassic at 4000 ft and 50 miles from the Dutch border. Schoonebeek in Holland averaged 14,000 b.d. Recently Denmark's first important oil indication was reported near Tondern at about 10,000 ft. Lacq in France has fourteen producers in the Cretaceous at about 2200 ft. In England the output was under 1000 b.d., while Italy had 250 b.d. and Austria 40,000 b.d. Yugoslavia produced 3500 b.d., and Roumania may have given 85,000 b.d. Hungary had 10,000 b.d., Poland 3500 b.d., and Czechoslovakia 2000 b.d., according to estimates. Albania is reported to have given 7000 b.d., while Russia may have obtained 800,000 to 900,000 b.d.

A successful well has been drilled 8 miles north of the Burghan field. The Uthmaniya wildcat, 30 miles south of Ain Dar, was successful. Iraq's output will rise substantially when pipelines are completed, and Kirkuk is scheduled for 600,000 b.d. at the end of 1955. Current Middle East production is 1,970,000 b.d.

In Northwest Pakistan production was 3200 b.d., in Assam over 5300 b.d., and Burma may have given about 3000 b.d. The Minas field of Mid-Sumatra is said to have reserves of 500,000,000 brl and an outlet is being constructed. South Sumatra has 121,000 b.d., and Java 12,400 b.d. British Borneo produced 102,500 b.d., the rest of Borneo 15,100 b.d., and New Guinea 5000 b.d. The Kansu field in China is estimated to have given 2000 b.d., Formosa 75 b.d., Japan 6500 b.d., and Sakhalin 9000 b.d.

G. D. H.

Transport and Storage

53. Highlights in Transcontinental's construction programme. F. E. Hangs. *Pipe Line News*, Oct. 1952, **24** (9), 34–44.—An account is given of the design, planning, construction, and operation of Transcontinental's recently completed 1840-mile system from Texas to New York. Technical details of pipe dimensions, operating pressures, compressor station design, dehydration plants, metering, and communication systems are given. A short history of the development and planning of the project is included, with some indication of future developments. F. M.

54. Lightline. Anon. *Fluid Handl.*, Sept. 1952 (32), 256.—The 30-inch light gauge pipeline from Palmarejo to Las Piedras covering 142 miles overland and 9 miles under water is described. Design capacity 235,000 b.d. D. H.

55. Trans-mountain oil pipeline. S. M. Blair and D. L. Roberts. *Engineering J., Montreal*, 1952, **35**, 930–5, 944.—The growth in the discovery, production, and refining of Canadian crude oil is outlined, and the crude oil reserves are assessed. The control of oil resources is described, and brief details of completed and under-construction pipelines that will be in use by about 1953 are given. The trans-mountain pipeline from Edmonton to Vancouver will be 720 miles long and 24 inch dia. The route it will follow, and alternative routes investigated and approx profiles are shown and fully described. The highest elevations to be traversed are: Yellowhead Pass, 3720 ft (1400 ft above Edmonton); Kamloops, B.C., 4000 ft; Coquihalla Pass, 3600 ft. When in full operation the line will handle some 20 million ton-miles per day. The production that will be available to Pacific markets up to 1955 is shown. The methods used in locating and designing the pipeline, and the procedure to be employed in its construction are described. W. H. C.

56. 2500 mile gas pipeline in Europe. Anon. *Pipe Line News*, Oct. 1952, **24** (9), 32.—A report of the Interparliamentary Union at Bern, Switzerland, in which is discussed the U.S. State Department study of the proposal to build a pipeline to transport natural gas from the Middle East to Europe. F. M.

57. Oil pipeline construction. S. E. Coomber. *Petroleum, Lond.*, Nov. 1952, **15** (11), 293–6.—A review of pipeline construction methods which fit a number of specialized techniques, such as pipeline welding and anti-corrosion methods, into a general constructional picture. (*See also* Abs. 1824, 1826, 1827, 1972, 2210—1952.) R. E. P.

58. How to join different sizes of pipe at odd angles. J. H. Barnhart. *Oil Gas J.*, 10.11.52, **51** (27), 105.—The use of templates to prevent trial and error cutting in the field is described. The method is quicker, neater, and more economical than previous one. Figures and equations illustrate the article. G. A. C.

59. Steam centrifugal compressors. F. B. Haverfield. *Pipe Line News*, Oct. 1952, **24** (9), 35–6. (*Condensed from paper to Amer. Gas Ass., Los Angeles, May* 1952.)—Transcontinental installed steam turbine driven centrifugal compressors on a 30-inch pipeline system along with a larger number of conventional gas engine driven stations. This paper presents a brief account of the steam centrifugal compressor stations with diagrams to illustrate pipe layout, steam balance, and efficiency over wide load range. Tables of operating costs and personnel requirements are also given. F. M.

60. Steam turbine drive for main line compressors. E. Sterrett. *Pipe Line News*, Oct. 1952, **24** (9), 47–53.—(*See* Abs. 59.) Details are given of the three stations on Transcontinental's pipeline powered by steam driven turbines. Some analysis is also given of the relative cost advantages and disadvantages as compared with conventional gas engine drive. Article is illustrated with numerous photographs of the stations at Eunice, Louisiana, Tylertown, Mississippi, and at Billingsly, Alabama. F. M.

61. Control for pipeline engines. C. B. Lester. *Oil Gas J.*, 13.10.52, **51** (23), 212.—Three control problems are discussed. Series, parallel, and differential water control, safety and load fuel system control, use of crude as fuel, corrosion prevention, continuous centrifuging, and shut-down devices are dealt with. G. A. C.

62. Radioisotope tracer successful in products-pipeline application. G. Weber. *Oil Gas J.*, 10.11.52, **51** (27), 115.—A report is given by Salt Lake Pipe Line Co. on two years' work with use of radioisotope for machine pipeline product interfaces. G. A. C.

63. New developments in remote control of pumping stations. M. Hyde. *Oil Gas J.*, 13.10.52, **51** (23), 202.—A report of recent installations and accounts of safety and operational features are given. Microwave control, instrumentation, automatic shut-down, " pig " detectors, start–stop operations, and automatic checking upon resumption after a power or channel failure are dealt with. G. A. C.

64. Plans for export of natural gas from Alberta. D. P. McDonald. *Canad. Min. metall. Bull.*, 1952, **45**, 618–23.—A survey is given of the evidence placed before the Petroleum and Natural Gas Conservation Board by the six concerns applying for licence for the export of natural gas to the U.S.A. Data covering the Canadian producing areas, the industrial and domestic requirements, production and estimated reserves are given. The interim report of the Board is surveyed, and details are given of the proposals made for serving Canada, British Columbia, Washington, Oregon, and Idaho in the west, and Saskatchewan, Manitoba, the eastern parts of Ontario, Quebec, in the east, and Minnesota, U.S.A. The proposed pipeline routes, size, mileage, frontier crossing points, capital costs, operating costs, and the probable surplus of gas available for transmission to the U.S.A. are described. The reciprocal agreements that must be made with the U.S.A. are discussed. W. H. C.

65. Motor tanker " Tynefield." Anon. *Mot. Ship*, 1952, **33**, 266.—The third post-war motor tanker for Hunting and Son Ltd., ran trials recently, during which the ship, which was designed for a service speed of 14 knots with main engines running at 105 r.p.m., attained a mean speed of about 15 knots with engines running at 110 r.p.m. The ship, of 18,500 tons d.w.c., is propelled by a 6-cyl Hawthorn-Doxford engine, of bore 725 mm and combined stroke of 2250 mm, which develops in service a total of 7600 b.h.p. at about 114 r.p.m. Length of ship is 557 ft, and cargo space is divided into nine main oil tanks, subdivided by two longitudinal bulkheads to give a total of twenty-seven cargo tanks. An oil-fuel cross-bunker and settling tanks, also a cofferdam, are arranged between the machinery space and the after cargo tanks, and a deep tank for oil fuel is provided forward below the cargo space ; oil fuel is also carried in the engine-room double bottom. *Tynefield* is now on time charter to the Anglo-Saxon Petroleum Co. The article is illustrated by photographs and general arrangement plans. U. M.

66. Exploitation of (rail) tank wagons. J. Kaczmarski. *Nafta (Krakow)*, 1951, **7**, 328–32.—Rail tanks are the principal means of transportation of petroleum products. Their cleanliness affects the industry greatly, and their cleaning is a job which is not only difficult, hard, and dirty, but often risky and detrimental to health. Methods of cleaning are : (1) " Cold " : two men bale out the remainder of previous load. They are protected by respiratory apparatus and joined by a rope. Their actions are described in detail ; they wash out the tank with water and/or solvents. (2) " Warm " : water can be used by men inside tank at temp not exceeding 40° C. It is better than cold water. (3) " Hot " : water jets will do the job better still, and the cleaners enter the tank to complete the work with solvents and brushes. (4) Very viscous liquids are " steamed " off the tank walls, removed from the floor, using brushes and shovels, and the walls are wiped dry with rags. If the tank is to be repaired it must be repeatedly steamed till samples are clear of CO and hydrocarbons. M. S.

67. Proper painting of tanks assures long life. Anon. *Oil Gas J.*, 20.10.52, **51** (24), 176.—Removal of rust, scale, and old paint from tank surface prior to priming,

examples of flaws, sandblasting, and quantity of paint to be applied are dealt with. A sample inspection record is given. G. A. C.

68. Draft [German] standard for identification of lubricant containers, lubricating equipment, and lubrication points. A. Bocker. *Erdöl u. Kohle*, 1952, **5**, 649–50.—DIN 51502 is reproduced. Types of lubricants, *i.e.*, grease, "standard" lub oil, lub oil "D" (cf. Abs. 1153—1952), special non-additive oils (*e.g.*, transformer oil), and special additive oils (*e.g.*, E.P. lubes) are respectively denoted by a triangle, circle, semicircle, square, and hexagon; grades within the types by ten colours. Types and grades corresponding to symbol–colour combination are tabulated. Symbols can be carried on suitable attached Al tags (which can also indicate required lubrication frequency in case of lubrication points on machinery), colours can be shown by plastic inserts or paint bands. V. B.

69. Patents. U.S.P. 2,598,835 (28.12.48; 3.6.52). M. A. Ryan, assr to Phillips Petroleum Co. Safety liquid level gauge for tanks containing liquids.

U.S.P. 2,599,162 (8.4.47; 3.6.52). J. Brown. Combination venting, filling, and gauging device for fuel oil tanks.

U.S.P. 2,600,015 (2.6.47; 10.6.52). G. F. McLaughlin. Storage system for pressurized fluids.

U.S.P. 2,600,073 (24.1.49; 10.6.52). N. Plank, assr to Shell Development Co. Pipeline pressure regulator.

U.S.P. 2,600,237 (16.5.47; 10.6.52). A. H. Graham, assr to General American Transportation Corpn. Centering and sealing device for a roof structure floating on the surface of a volatile liquid in a tank.

U.S.P. 2,600,341 (27.10.49; 10.6.52). L. E. Thompson. Liquid level gauge for storage takes with means for recording at a remote receiving station.

U.S.P. 2,601,270 (12.11.46; 24.6.52). E. S. Fraser and C. M. Orr, assrs to Chicago Bridge & Iron Co. Storage tank for liquids.

U.S.P. 2,601,313 (13.11.45; 24.6.52). C. J. Merriam, assr to Chicago Bridge & Iron Co. Storage vessel for volatile liquids.

U.S.P. 2,601,316 (16.10.48; 24.6.52). F. D. Moyer, assr to Chicago Bridge & Iron Co. Drain for floating roof storage tanks.

U.S.P. 2,601,317 (26.6.46; 24.6.52). F. D. Moyer, assr to Chicago Bridge & Iron Co. Vapour vent for floating roof tanks. J. M. S.

Refinery Operations

Refineries and Auxiliary Refinery Plant

70. Progress at Coryton. Anon. *Petrol. Times*, 28.11.52, **36**, 1011.—A review is presented of the Vacuum Oil Co.'s new refinery at Coryton. The plant is not yet completed, but an account of the process units being installed, future operation, and contribution made by British equipment companies is given. G. A. C.

71. Kent refinery: Isle of Grain. Anon. *Fluid Handl.*, Sept. 1952 (32), 259–66; Oct. 1952 (33), 289–94; Nov. 1952 (34), 318–22.—The layout of the 4 million ton p.a. refinery and the designed capacities of individual units are given. The greater part of the site is reclaimed marshland, and heavier units were built where foundations could be taken down to the bed of London clay.

The pipeline equipment for each of four jetties is detailed, together with tank farm capacities and pumps. The installation of electric heat tracing is described with detailed drawings.

750,000 g.p.h. of seawater, used for cooling purposes, flows in a 4000-ft open channel to the refinery. Chlorination, pumping, effluent disposal, steam distribution, fresh and boiler feed water treatment, and other services are described. D. H.

72. Canada's newest oil refinery. E. A. Smith and F. J. Malslyk. *Petrol. Process.*, 1952, **7**, 1448–51; *Oil Gas J.*, 22.9.52, **51** (20), 92; *Petrol Engr.*, Oct. 1952, **24** (10), C55–62.—The features of the largest and newest oil refinery in Canada, at Sarnia, Ontario, capable of processing 20,000 b.d. of Alberta (Redwater) crude oil are described. Among the many units, the most notable are the 8300-b.d. Orthoflow fluid cracking unit, and a 3800-b.d. catalytic reforming unit (Platformer type).

Many of the outstanding details of the refinery, such as waste disposal, process control, and the utility systems, are reviewed. J. W. H.

73. Gasoline plant design. Pt 7. O. L. Lewis. *Petrol. Engr*, Sept. 1952, **24** (10), C39–42.—The fields of application, and service limitations of seven types of flange are presented with details of types and functions of: (1) gaskets and (2) flange bolting. E. K. J.

74. Phillips' Borger refinery throughput capacity now rated at 80,000 barrels per day. S. C. Reidel. *Oil Gas J.*, 21.9.52, **51** (20), 116.—This is the largest refinery in the U.S. without access to navigable waterways. Crude sources are: (1) local, (2) Pampa, and (3) West Texas.

Units include electrical desalting, fluid catalytic cracking, SO_2 solvent extraction of recycle stock, and residuum processing. G. A. C.

75. Reconstruction and expansion of German refineries. Ebano refinery. F. Schmeling. *Erdöl u. Kohle*, 1952, **5**, 633–6. This Esso plant was founded in 1928, capacity in 1938 was 390,000 tons/year, but 80% was destroyed during war. Current feed stocks are Tia Juana naphthenic crude and paraffinic from Arabia; former is source of low-pour lubs and bitumen, latter provides industrial solvents and fuel oil, whilst both crudes yield engine fuels. Details are given of plant and process for hypochlorite refining of gasoline, production of industrial solvents (acid refining followed by re-running), and lub production (removal of naphthenic acids by caustic spray behind tube still, re-distillation, followed by continuous acid treatment). Expansion programme to 1½ million tons/year includes cat cracker. V. B.

76. Cylindrical tube furnace in a benzole works. E. Wenzel. *Erdöl u. Kohle*, 1952, **5**, 637–8.—Description of a gas-heated furnace for benzole wash-oil. Capacity is 30 m³/hr, benzole is heated over 105° to 167° C, and thermal efficiency is 90%. Design of oven should give 80% efficiency if used at higher oil-outlet temp customary in pet industry. V. B.

77. Electrical treater solves problem of desludging cracked gasolines. D. H. Stormont. *Oil Gas J.*, 27.10.52, **51** (25), 125.—An electrical treater is described through which gasoline from settler is passed and subjected to a high voltage electrical field which causes coagulation of dispersed particles and subsequent settling as sludge. Safety features are incorporated. G. A. C.

78. Greater heat recovery from catalytic flue gas. G. Weber. *Oil Gas J.*, 13.10.52, **51** (23), 346.—A new catalytic oxidn unit at Sun Oil Co., Marcus Hook, Pa, refinery is utilized to burn heavy hydrocarbon vapours and carbon monoxide in flue gas stream. Air pollution and heat loss are reduced. G. A. C.

79. Low temperature insulation for refinery service. W. L. Martin. *Oil Gas J.*, 3.11.52, **51** (26), 99.—Insulation and accessory materials, design and specifications, installation and maintenance are dealt with; and tables give properties of various insulating materials and water-vapour permeability of some weather-proofing materials. G. A. C.

80. New procedure in industrial thermal-insulation application. C. J. Kuhasz and E. C. Shuman. *Oil Gas J.*, 3.11.52, **51** (26), 90.—Methods are described which drastically reduce the installed cost of thermal insulation to metal surfaces of vessels, equipment, piping, valves, fittings, etc. Method can be employed for all operating metal temps up to 1200° F specifying hydrous calcium silicate in a single thickness.

Methods of installing the insulation, applying weather-proofing such as asphaltic products and sealing of joints are described. Advantages of method and specifications, equipment required, and storage arrangements are given. G. A. C.

81. Self-retaining mineral wool boards. Anon. *Petrol. Engr*, Oct. 1952, **24** (11), C35–6.—The insulation of high temp vessels with uniform curvature has been conveniently carried out using mineral wool board sections wedged into a framework of metal jacket segments which can be clipped round the vessel to be lagged. E. K. J.

82. Nomograms for determining lagging thicknesses for steam pipes. J. Breuil. *Chim. et Industr.*, 1952, **68**, 530–3.—Three nomograms are given enabling calculations to be made of hourly calorie saving by use of lagging. Range covered is steel pipes 1 to 30 cm dia, up to 100 m long, fluid temp 10° to 1000° C, lagging thicknesses 1 to 10 cm, thermal conductivity of lagging 0·01 to 0·30. Additional diagram converts result to kg.coal/hr, for effective cal val of latter 1000 to 10,000. V. B.

83. Heat transfer. B. E. Lauer. *Oil Gas J.*, 15.9.52, **51** (19), 139; 22.9.52, **51** (20), 143; 29.9.52, **51** (21), 317; 6.10.52, **51** (22), 139; 27.10.52, **51** (25), 143; 3.11.52, **51** (26), 132; 10.11.52, **51** (27), 161.—Pt 5 continues with coeffs of heat transfer through a film between surface of warm vertical wall and boiling liquid, cool horizontal wall and warm gas.

Pt 6 discusses coeffs of heat transfer through film between cool horizontal wall and warm gas.

Pt 7 dealt with coeffs of heat transfer through film between cool horizontal wall and warm liquid.

Pt 8 is concerned with coeffs of heat transfer through film between warm horizontal wall and cool gas.

Pt 9 is on coeffs of heat transfer through film between warm horizontal wall and boiling liquid.

Pt 10 continues with coeffs of heat transfer through film between various parallel flat surfaces and cool gas.

Pt 11 also deals with coeffs of heat transfer through film between warm parallel flat surfaces and cool gas. G. A. C.

84. How to power the refinery. C. W. Bloedorn. *Petrol. Process.*, 1952, **7**, 1280–5.—Refineries must be able to produce adequate electric power at a low cost, without frequency variations, and must also supply the necessary high and low pressure steam for the numerous processes requiring steam. It is for these reasons that refineries have become large users of steam turbines.

High thermal efficiency in refinery power plant operation can only be obtained by having a proper balance between process steam and power.

The most desirable equipment is that giving max reliability at a min cost. J. W. H.

85. Don't let heat go up your flue. W. C. Uhl. *Petrol. Process.*, 1952, **7**, 1444–6.—A method of saving fuel and preventing pollution of air from flue gases by catalytically oxidizing the CO to CO_2 with consequent heat recovery by means of molten salt, circulated through finned tubes in the oxidn chamber, is described. The catalyst elements are six inches long, and are ceramic sticks covered with an active platinum base film; these are staggered, and the flue gas flows across the bank with an inlet temp of 775° F, and an exit temp after oxidn of 1075° F. The circulating salt cools the flue gas to 825° F. Heat recovery by this means has been found to be most successful in a fixed bed Houdry catalytic cracking unit, with 80% of the heat liberated by the oxidn process being converted to high pressure steam. Even greater heat recovery is believed possible in moving bed catalytic cracking operations.

J. W. H.

86. Fans and blowers. M. Van Winkle. *Oil Gas J.*, 21.9.52, **51** (20), 133; 28.9.52, **51** (21), 307; 6.10.52, **51** (22), 133; 20.10.52, **51** (24), 181; 27.10.52, **51** (25), 135; 3.11.52, **51** (26), 129; 10.11.51, **51** (27), 157.—No. 23 in the Engineering Reference Section deals with the control of fans. Use of dampers and variable speed drives; and fan and drive arrangement are discussed.

No. 24 deals with specifications for fans and blowers, notes on installation and on fluid dynamics.

No. 25 is concerned with fan calculations, taking into account the properties of gases and vapours and effect of entrained solids.

No. 26 deals with evaluation of friction losses of fans and blowers by making an energy balance. A simplified equation is worked out.

No. 27, on fans and blowers, is on the subject of expansion and extraction losses. An equation is provided and an example worked out.

No. 28 deals with friction losses in ducts and elbows. Equations are provided and examples worked out, and a method of calculating simple elbow friction losses by means of a table is given.

No. 29 deals with calculating fan pressure. An example is provided and solved. G. A. C.

87. Refinery instrumentation. Pt 3. Factors in maintenance of continuous balance potentiometers. S. D. Ross and J. Procopi. *Petrol. Engr*, Sept. 1952, **24** (10), C20–9; Oct. 1952, **24** (11), C39–49.—The first two parts gave an elementary introduction to the science of instrumentation which is continued with a detailed analysis of the maintenance of electronic potentiometers pointing out the advantage of preventive maintenance.

Pt 4. Thermocouples and extension wire. Five common types of thermocouple and their applications are described with details of the construction of terminal heads, extension wire, and protecting tubes. Practical factors to be considered for installation and maintenance of thermocouples are outlined to provide accurate temperature measurement over long periods. E. K. J.

88. Determination of orifice meter coefficients. H. S. Chio. *Petrol. Engr*, Oct. 1952, **24** (11), C5–22.—The three parts of the paper detail: (1) the basic equations for flow through an orifice, (2) the measurement of liquids, and (3) the measurement of gases, especially natural gas. Formulæ and methods for the derivation of conversion and correction factors for orifice meter coeffs are given with extreme accuracy. The derived formula for the quantity of liquid flowing in terms of the differential head of the meter contains six correction factors, and that for gas flow in terms of differential head and static pressure contains nine correction factors. E. K. J.

89. Force balance pressure transmitters used to detect column flooding. G. W. Swinney. *Oil Gas J.*, 27.10.52, **51** (25), 108.—Various types of pressure measuring instruments are compared with the force-balance pressure transmitter in measuring column pressure drop. The latter instrument has provided the first successful means of such measurements being recorded continuously and accurately. G. A. C.

90. Methods of atomizing liquid fuel. J. R. Joyce. *Fluid Handl.*, Oct. 1952 (33), 295–9.—The types of burners in industrial use are classified into: (1) atomization by a second fluid, *e.g.*, high, medium, and low pressure air or steam; (2) rotary atomizers, and (3) pressure jets.

The first group is widely used in small installations because of flexibility and ease of control. Above 500 lb/hr, the fans and compressors required are too expensive, and the pressure jets are superior. The range of capacities for this type extends from fractions of 1 gal to 5 tons/hr although the range of any one burner is small.

The choice of atomizer according to cost and duty is discussed. D. H.

91. Materials for high and low temperature in chemical industry. G. E. Tummers. *Ingenieur, 's Grav.*, 17.10.52, **64** (42), Ch.97–106.—Carbon steel does not give any mechanical trouble between 0° and 300° C. Above 300° and below 0° C it has to conform to certain requirements concerning creep resistance for high temp and notch toughness for lower temp. Outside the −50° and 400° C limits alloy steel has to be used. Means of improving, by alloying, the creep resistance and notch toughness at extreme temps are discussed and illustrated with seventeen graphs. The chemical composition, structure, and characteristic values as related to temp, for the principal ASTM, BSI, and DIN steels are compiled in three tables. Finally, various notch–impact tests are critically examined, and the values obtained are found to be only relative and not comparable. G. F. T. C.

92. Patents. U.S.P. 2,598,746 (14.3.50; 3.6.52). J. S. Adams and P. E. Wilson. Centrifugal separator for separating oil from water.

U.S.P. 2,598,816 (18.7.41; 3.6.52). W. F. Mesinger, assr to Union Carbide and Carbon Corpn. Apparatus for pumping volatile liquids.

U.S.P. 2,598,840 (9.4.51; 3.6.52). A. H. Schutte, assr to The Lummus Co. Heater for hydrocarbon fluids.

U.S.P. 2,598,879 (29.3.49; 3.6.52). M. W. Barnes, assr to Universal Oil Products Co. Heating apparatus for fluids.

U.S.P. 2,599,466 (France 8.5.43; 3.6.52). J. Lienhart, assr to Compagnie Française De Raffinage. Combined liquid decanter and gas separator for use in separating gaseous and two-phase liquid systems.

U.S.P. 2,600,078 (25.8.48; 10.6.52). A. H. Schutte and V. O. Bowles, assrs to The Lummus Co. Heat transfer pebbles made of hard, refractory coke from heavy hydrocarbons.

U.S.P. 2,600,595 (13.1.50; 17.6.52), J. R. Wilson, assr to Hanlon and Wilson Co. Heat exchanger.

U.S.P. 2,600,710 (15.11.47; 17.6.52). H. N. Wade. Bubble cap for use in a gas–liquid contacting column.

U.S.P. 2,600,733 (6.12.50; 17.6.52). T. L. Clift, assr to Standard Oil Co. Gas mixing apparatus.

U.S.P. 2,600,836 (16.10.47; 17.6.52). J. W. Boyd, assr to Phillips Petroleum Co. Self-cleaning gate valve.

U.S.P. 2,600,871 (27.6.49; 17.6.52). R. W. Helwig, assr to Gulf Research & Development Co. Continuous conveyor-reactor for reactions in which a fluid is treated with a particulate solid.

U.S.P. 2,601,298 (8.2.49; 24.6.52). P. C. Keith, assr to Hydrocarbon Research Inc. In the cooling of gaseous streams by passage over cooling surfaces on which condensible material tends to deposit in frozen form, the deposition of frozen material is prevented by moving over the cooling surfaces a particulate absorbent for the condensible material.

U.S.P. 2,601,667 (12.2.48; 24.6.52). K. Permann, assr to Shell Development Co. Tube heater with flue gas recirculation.

U.S.P. 2,601,674 (Netherlands 18.6.48; 24.6.52). G. H. Reman, assr to Shell Development Co. Liquid contacting apparatus with rotating disks. J. M. S.

Distillation

93. Evaporation of a free water surface into a stream of air. [In English.] E. F. M. Van der Held. *Ingenieur, 's Grav.*, 10.10.52, **64** (41), Ch. 89–94.—In connexion with the work of Hilpert a more generally holding formula is derived for the relation between heat and mass transfer during the evaporation from a free liquid surface into a gas stream. Schirmer has given a formula for the coeff of diffusion of water vapour in air in function of temp and pressure, which described his and Kirschbaum's measurements closely. Therefore this formula was used in deducing conclusions from the measurements of Hilpert, Kirschbaum, and Lewis on the mutual influence of evaporation and heat transfer for different forms of gas flow. Limits for the validity of the formula are given. Finally, a formula for the rate of evaporation is exposed, valid between the same limits. A table is compiled, giving the values of the psychrometer constant for different types of gas flow and surface temp. The evaporation inside closed tubes is treated in an appendix. G. F. T. C.

94. New bubble tray design. Anon. *Petrol. Process.*, 1952, **7**, 1447.—A new type tray consisting of a flat grating assembly extending over the entire column cross-section has been developed. The openings in the grating are parallel slots of appropriate length, width, and number. Higher efficiencies and capacities are reported possible with the new "Turbogrid" tray than with the conventional type bubble cap tray

for vapour–liquid contacting. Lower pressure drops and higher vapour capacities are prevalent owing to the absence of downcomers. Both vapour and liquid flow uniformly through the slots in the tray. J. W. H.

95. How to calculate cooling tower control variables. M. R. Beychok. *Petrol. Process.*, **7**, 1452–6.—A set of equations is presented for the inter-relationship of the flow quantities, make up, draw off, and concentration cycles for the design and testing of cooling tower operational efficiencies.

An extremely useful nomograph using these variables and a chart for cooling water sulphates are given. J. W. H.

96. Patents. U.S.P. 2,593,159 (9.3.48; 15.4.52). I. L. Malm, assr to Cities Service Oil Co. Distillation process for purifying a mixture of synthetically produced organic materials including hydrocarbons, oxygenated compounds, and water.

U.S.P. 2,593,931 (31.12.47; 22.4.52). M. V. Stearns, assr to The M.W. Kellogg Co. Improvements in the separation, by fractional distillation, of a solvent extract solution containing extract, a lower-boiling solvent, and an anti-solvent of lower b.p. than the solvent.

U.S.P. 2,595,116 (20.8.49; 29.4.52). S. W. Wilson, assr to Standard Oil Development Co. Azeotropic distillation of *iso*propyl alcohol to remove odour therefrom. R. C. R.

U.S.P. 2,600,106 (10.6.48; 10.6.52). B. S. Garrett, assr to Standard Oil Development Co. In the extractive distillation of hydrocarbons containing readily polymerizable diolefins in presence of glycols, furfural or acetone, the extract solution (more unsaturated compounds plus solvent) is passed to a desorption zone, where it is heated under pressure to react unstable components to form high boiling products and to desorb the more stable components, the solvent plus high boiling products removed and the latter separated from the solvent by adsorbent clay or activated carbon.

U.S.P. 2,600,110 (4.1.49; 10.6.52). K. H. Hackmuth, assr to Phillips Petroleum Co. Internal-refrigerant low-temp fractional distillation.

U.S.P. 2,600,182 (12.5.48; 10.6.52). G. B. Arnold and L. Kovach, assrs to The Texas Co. Refining kerosines and gas oil by ternary azeotropic distillation with furfural and water.

U.S.P. 2,600,184 (27.11.51; 10.6.52). G. B. Arnold and L. Kovach, assrs to The Texas Co. Refining kerosines and gas oil by ternary azeotropic distillation with phenol or aniline and water.

U.S.P. 2,601,077 (16.6.49; 17.6.52). R. Wylie, assr to Standard Oil Development Co. Distillation of light hydrocarbons.

U.S.P. 2,601,599 (26.11.48; 24.6.52). P. H. Deming, assr to Shell Development Co. Wet hydrocarbon gas is subjected to fractional distillation under pressure to separate dry gas from the liquefiable hydrocarbons. J. M. S.

Ger.P. 842,107, 8.5.52. W. Kappelhof, assr to Heinrich Koppers. Tube distillation furnace.

BrennstChemie, 1952, **33** (11–12). R. T.

Absorption and Adsorption

97. Patents. U.S.P. 2,594,557 (5.1.49; 29.4.52). A. E. Hirschler, assr to Sun Oil Co. Separating two alkanes of the same mol. wt. by selective adsorption by silica gel.

U.S.P. 2,594,615 (10.9.46; 29.4.52). C. H. O. Berg, assr to Union Oil Co. Continuous process for the separation of a gaseous mixture by selective adsorption and desorption with a continuously moving bed of solid adsorbent. R. C. R.

U.S.P. 2,598,785 (4.1.50; 3.6.52). J. L. Groebe and J. T. Karbosky, assrs to Phillips Petroleum Co. Gaseous hydrocarbon streams are compressed and cooled to condense C_3 and higher hydrocarbon materials, and the uncondensed nitrogen and

methane are fractionally separated by low temp distillation. The overhead fraction from this distillation containing nitrogen and methane is separated by selective adsorption.

U.S.P. 2,599,545 (26.12.47; 10.6.52). C. J. Egan and J. W. Scott, assrs to California Research Corpn. Cyclic adsorption process for separation of liquid mixtures.

U.S.P. 2,600,133 (27.10.49; 10.6.52). R. K. Simms, assr to Phillips Petroleum Co. Method of maintaining B.Th.U. content of residue gas from absorbers. J. M. S.

Solvent Extraction and Dewaxing

98. Patent. U.S.P. 2,600,389 (23.12.48; 17.6.52). B. C. Benedict, assr to Phillips Petroleum Co. Three-stage propane fractionation of reduced crude oil. J. M. S.

Cracking

99. New research equipment for the refining industry. Pilot plant for reforming and thermal cracking. I.F.P. Applied Research Centre. *Rev. Inst. franç. Pétrole*, 1952, **7**, 303–10.—Detailed description, with drawing, of unit intended for thermal reforming of gasoline, thermal cracking of distillates, and visc-breaking of residue. Throughput is 5 to 27 litres/hr. Pre-heater and furnace were specially designed (diagram given), and are of special steel. Electric heating is used throughout. Operating procedure when reforming (12 litres/hr) is described and typical results given; these are in excellent agreement with yield figures obtained on 500 ton/day industrial plant. V. B.

100. Patents. U.S.P. 2,592,646 (7.10.48; 15.4.52). R. T. Bell, assr to The Pure Oil Co. Regenerating and preconditioning a methanethiol synthesis catalyst by burning off in an oxidizing atmosphere at least 25° C below the sintering temp of the catalyst, and thereafter maintaining the treated catalyst for up to 2 hr at 50° to 150° C below normal synthesis operating temperature in an atmosphere of MeOH.

U.S.P. 2,592,765 (26.5.43; 15.4.52). C. L. Thomas and J. C. Morrell, assrs to Universal Oil Products Co. Dehydrogenating hydrocarbons in the presence of a catalyst comprising 50 to 90% aluminium oxide, 5 to 30% of kaolin or montmorillonite, and 4 to 20% of an oxide of a metal selected from the elements in the left-hand columns of Groups 5 and 6 of the Periodic Table.

U.S.P. 2,592,775 (29.9.48; 15.4.52). J. P. West, assr to Universal Oil Products Co. Preparing a silica catalyst containing alumina and/or magnesia by reacting an alkyl orthosilicate with a monobasic aluminium organic salt and/or a magnesium organic salt at 150° to 300° C and under pressure, and calcining the resultant product.

U.S.P. 2,593,097 (9.12.50; 15.4.52). W. E. Burt, J. J. Burt, and W. B. Ligett, assrs to Ethyl Corpn. Thermally stable silver oxidn catalyst which is readily fluidized, comprising silver on a zirconium oxide–silicon oxide support. The process of making ethylene oxide by oxidizing ethylene in the presence of this catalyst is also covered.

U.S.P. 2,593,098 (9.12.50; 15.4.52). W. E. Burt, assr to Ethyl Corpn. An oxidn catalyst comprising 4 to 50% Ag, a support, and 0·5 to 4% of an organic promoter. The process of making ethylene oxide by ethylene oxidn in the presence of this catalyst is also covered.

U.S.P. 2,593,099 (9.12.50; 15.4.52). G. Calingaert, assr to Ethyl Corpn. Magnesium oxide–barium oxide silver catalyst and the production of ethylene oxide by oxidn of ethylene in the presence thereof.

U.S.P. 2,593,100 (9.12.50; 15.4.52). G. Calingaert, assr to Ethyl Corpn. Oxidn catalyst comprising 4 to 50% Ag on an MgO–Al_2O_3 spinel support.

U.S.P. 2,593,720 (18.11.48; 22.4.52). M. S. Bielawski, assr to Universal Oil Products Co. Supported phosphoric acid catalyst containing 0·5 to 5% of a pine wood pitch resin binder.

U.S.P. 2,594,289 (29.10.47; 29.4.52). C. L. Caldwell, assr to Houdry Process Corpn. Improvements in a system wherein a fluidized solid hydrocarbon conversion catalyst is circulated through a conversion zone and then through a regeneration zone.

U.S.P. 2,594,301 (17.6.47; 29.4.52). D. B. Eastman and L. P. Gaucher, assrs to The Texas Co. Improvements in the synthesis of liquid hydrocarbons by the catalytic reduction of carbon monoxide with hydrogen.

U.S.P. 2,595,056 (27.1.49; 29.4.52). G. C. Connolly, assr to Standard Oil Development Co. Preparing a silica–metal oxide gel catalyst. R. C. R.

U.S.P. 2,599,568 (31.12.47; 10.6.52). D. D. McKinney, assr to Houdry Process Corpn. Gas disengaging apparatus for catalytic contacting plant.

U.S.P. 2,600,360 (22.7.49; 10.6.52). A. V. Grosse. In the regeneration of cracking catalyst having a carbonized surface, the oxidizing gas is mixed with chlorine or bromine and a chloride of silicon, zirconium, titanium, or aluminium in order to suppress carbon dioxide formation so that carbon monoxide predominates in the resulting gases.

U.S.P. 2,600,430 (9.8.47; 17.6.52). E. W. Riblett, assr to Hydrocarbon Research Inc. Hydrocarbon oils are cracked and solid carbonaceous materials converted to valuable products in a single process. The solid residue from the carbonaceous materials is passed through three intercommunicating zones, in the first of which it is subjected to an exothermic gasification reaction, in the second it is mixed with fresh carbonaceous material and carbonized to remove volatile constituents, and in the third it is contacted with hydrocarbon oil which is cracked. The residue from the third zone returns to the gasification zone.

U.S.P. 2,601,624 (3.12.47; 24.6.52). J. R. Owen and J. W. Myers, assrs to Phillips Petroleum Co. The mechanical strength of gel catalyst pellets compacted from particulate catalyst consisting of aluminium oxide and chromium, vanadium, or beryllium oxide, is increased by impregnating the pellets with a solution of a compound of chromium, vanadium, or beryllium and calcining the impregnated pellets. J. M. S.

Ger.P. 841,285, 30.4.52. W. Flesch, assr to Bad. Anilin- & Soda-Fabr. Process for cracking hydrocarbons.

Ger.P. 841,286, 30.4.52. W. Wolf, assr to Bad. Anilin- & Soda-Fabr. Installation and procedure for carrying out reactions in the gas or vapour phase leading to carbonaceous separations especially for cracking of hydrocarbons.

Ger.P. 844,440, 29.5.52. W. Urban and H. Stärker, assrs to Scholven-Chemie. Process for catalytic pressure-refining of benzene hydrocarbons.

Ger.P. 844,361, 29.5.52. H. Berger, Höchster. Method for production of a catalyst for fixing of gases, especially methane.
BrennstChemie, 1952, **33** (11–12).

Ger.P. 848,035, 3.7.52. W. Herbert, assr to Metallges A.G. Process and installation for carrying out exothermic cat reactions in cat furnaces. (Addn to Pat. 838,598).

Ger.P. 846,691, 19.6.52. W. Herbert, H. W. Gross, and A. Schall, assrs to Metallges A.G. Method for producing, when necessary, iron cat containing supporters as kieselguhr or activated charcoal.
BrennstChemie, 1952, **33** (13–14). R. T.

Hydrogenation

101. Patents. U.S.P. 2,599,089 (20.9.48; 3.6.52). J. E. Castle and B. W. Howk, assrs to E.I. du Pont de Nemours & Co. *cyclo*Alkanols, *cyclo*alkanals, and *cyclo*alkanones are converted to the corresponding *cyclo*alkanes by passing them with hydrogen, in the vapour phase, over a platinum catalyst at 140° to 350° C. J. M. S.

Ger.P. 835,138, 28.2.52. A. R. Powell, assr to Koppers Co. Procedure for temp regulation in reaction zone in carbon monoxide hydrogenation.
BrennstChemie, 1952, **33** (7–8).

Ger.P. 843,842, 21.5.52. K. Goetze, assr to Bad. Anilin- & Soda-Fabr. Process for catalytic pressure hydrogenation of coals, tars, and mineral oils in the liquid phase.

Ger.P. 844,290, 29.5.52. G. Ibing and E. Frese, assrs to Ruhröl G.m.b.H. Process for hydrogenation of pitch from low-temp carbonization of coal.

Ger.P. 842,990, 15.5.52. W. Schneider, assr to Bad. Anilin- & Soda-Fabr. Process for reforming or dehydrogenation of hydrocarbons.
BrennstChemie, 1952, **33** (11–12).

Ger.P. 847,143, 19.6.52. W. Herbert and P. Royen, assrs to Metallges A.G. Process for recovery of hydrocarbons by cat carbon monoxide hydrogenation.

Ger.P. 846,690, 19.6.52. W. Oettinger, W. von Füner, and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Process for dehydrogenation of naphthenic hydrocarbons. (Addn to Pat. 839,936.)

Ger.P. 845,039, 5.6.52. W. Schaub, A. Hagemann, and W. Brötz, assrs to Ruhrchemie A.G. Process for cooling carbon monoxide hydrogenation furnaces.
BrennstChemie, 1952, **33** (13–14). R. T.

Polymerization

102. Patents. U.S.P. 2,598,811 (26.11.48; 3.6.52). J. E. Mahan and S. D. Turk, assrs to Phillips Petroleum Co. Aromatic nitriles are polymerized to 1 : 3 : 5-triazines using an alkali metal amide or hydride or an alkaline earth metal hydride as catalyst.

U.S.P. 2,599,249 (7.3.50; 3.6.52). B. S. Friedman, assr to Sinclair Refining Co. Ethylene and butadiene are copolymerized in presence of cobalt oxide–charcoal catalyst at 165° to 575° C, a pressure between 100 and 1000 p.s.i.g., and at a reaction space velocity of 25 to 400 vols of each reactant per vol of catalyst per hr.

U.S.P. 2,599,743 (4.6.49; 10.6.52). L. F. Brooke, assr to California Research Corpn. Liquid olefins boiling below 350° F, separated from the catalytic polymerization of propylene, are contacted with liquid phosphoric acid at a temp below 325° F at a space velocity $>0{\cdot}2$ vols hydrocarbon per vol acid per hr.

U.S.P. 2,599,817 (12.1.48; 10.6.52). T. W. Evans and E. C. Shokal, assrs to Shell Development Co. An alkenyl monoether of 2 : 3-glycidol, 1 : 3-glycidol, or a homologue thereof containing not more than six carbon atoms is polymerized in the liquid phase at 50° to 300° C in presence of a peroxide catalyst.

U.S.P. 2,600,679 (12.5.47; 17.6.52). H. F. Park, assr to Monsanto Chemical Co. Butadiene and acrylonitrile are copolymerized at 30° C in an aqueous emulsion containing the sodium sulphonate of dioctyl succinate, potassium persulphate, sodium bisulphite, and dodecyl mercaptan.

U.S.P. 2,600,680 (12.5.47; 17.6.52). H. F. Park, assr to Monsanto Chemical Co. Isoprene and *n*-butyl crotonate are copolymerized at 75° C under pressure in an aqueous emulsion containing carbon tetrachloride, the sodium sulphonate of dioctyl succinate, potassium persulphate, and sodium hydroxide.

U.S.P. 2,600,695 (2.7.47; 17.6.52). M. L. Sans, assr to S.A. des Manufactures des Glaces et Produits Chimiques de Saint-Gobain. Vinyl chloride is passed over activated carbon in gas phase and polymerized by heating at 30° to 70° C in presence of a peroxide catalyst and a salt of an acid capable of reacting with HCl.

U.S.P. 2,600,804 (13.4.48; 17.6.52). J. S. Rearick, assr to The M.W. Kellogg Co. Trifluorochloroethylene is polymerized at −20° to 25° C in the presence of a halogenated acyl peroxide and at a pressure to maintain the monomer in the liquid phase.

U.S.P. 2,600,821 (30.3.48; 17.6.52). J. M. Wrightson, assr to The M.W. Kellogg Co. Trifluorochloroethylene is polymerized in the presence of bistrichloracetyl peroxide and a liquid diluent which is a saturated hydrocarbon or halogenated hydrocarbon under conditions whereby the diluent distils off under the heat evolved on polymerization.

U.S.P. 2,601,293 (1.4.50; 24.6.52). E. G. Howard, assr to E.I. du Pont de Nemours & Co. Polymerization of ethylenically unsaturated compounds is initiated in the presence of a hydrazone, a peroxide, and cupric ions.

U.S.P. 2,601,632 (25.11.49; 24.6.52). W. B. Reynolds and C. F. Fryling, assrs to Phillips Petroleum Co. Synthetic rubber is made by polymerizing at $<0°$ C an aqueous

dispersion of equal parts by wt of at least four of the following: butadiene, isoprene, piperylene, methylpentadiene, and dimethylbutadiene.

U.S.P. 2,601,673 (9.4.51; 24.6.52). F. M. McMillan and E. T. Bishop, assrs to Shell Development Co. A small quantity of 2 : 2 : 4 : 6-tetramethyldihydropyridine is added during the aqueous emulsion polymerization of styrene in the presence of a peroxide catalyst. The pyridine derivative acts as a short-stopper. J. M. S.

Alkylation

103. Novel catalytic conversions of olefins. K. Ziegler *et al.* *BrennstChemie*, 1952, **33** (11–12), 193–200 (*Lecture in Max-Planck Inst. for coal research, Mülheim (Ruhr.)*—Novel reactions of Li alkyls are described. Dist in vac yields, by ethylene addition, higher homologues which decomp into LiH and α-olefins on heating. LiH carries Li to olefins with >2 C-atoms, forming paraffins and diolefins which polymerize and poison the cat. Substituting $LiH.AlH_3$ for LiH and heating to *ca* 180° to 200° C under pressure with ethylene yields practically pure mixed α-olefins. Since $LiAlH_4$ decomposes at 120° C, the active cat is $LiAl(C_2H_5)_4$: $LiAlH_4 + 4C_2H_4 \rightarrow LiAl(C_2H_5)_4$. AlH_3 yields $Al(C_2H_5)_3$ and reacts more readily with ethylene, mono-substituted ethylenes, and *iso*butylene-type hydrocarbons. Reaction mechanisms of AlH_3 and $LiAlH_4$ and operating techniques are discussed. Grignard and Friedel–Craft procedures are compared with them. At *ca* 100° C $Al(C_2H_5)_3$ briskly absorbs ethylene, yielding, according to the ethylene ratio, a complex mixture of different trialkyls. Hydrocarbon mixtures of every desired mol-size from liq paraffin to high-mol wax are obtainable. In combination with the Oxo-synthesis, olefins with *n* C-atoms are converted into acids, alcohols, or aldehydes with $n + 1$ C-atoms. As the dimerized forms can be dimerized further with acid cat, so can the tetrameric forms C_{12} or C_{16} be dimerized. Aromatization of dimeric olefins or suitable mixed dimers yields substituted phenols. Mixed dimers propylene and butylene yield toluene, a simple synthesis from low-mol gases from cracking. Dimeric butylene yields *p*-xylene, the starting material for terephthalic acid, which combines with ethylene glycol the basis of Terylene fibre. Thus terephthalic acid is synthesized from benzene in three stages with butylene and four stages with ethylene. R. T.

104. Patents. U.S.P. 2,598,724 (24.2.48; 3.6.52). L. Schmerling, assr to Universal Oil Products Co. Ethylene is condensed with petrolatum in presence of an organic peroxide. J. M. S.

U.S.P. 2,592,625 (14.6.49; 15.4.52). C. R. Wagner, assr to Phillips Petroleum Co. The continuous production of alkenyl quinolines by passing olefin and a molecular excess of quinoline over a solid silica–alumina alkylation catalyst at 400° to 700° F, and thereafter catalytically dehydrogenating the alkylated quinoline product at 800° to 1200° F, unreacted material from each stage being returned for further treatment.

U.S.P. 2,594,343 (20.11.42; 29.4.52). H. Pines, assr to Universal Oil Products Co. *iso*Paraffin alkylation with olefins having terminal double bonds. R. C. R.

Isomerization

105. Patents. U.S.P. 2,592,740 (30.8.47; 15.4.52). J. A. Ridgway, assr to Pan American Refining Corpn. Catalytic conversion of hydrocarbons which are higher boiling than gasoline into lower boiling hydrocarbons, at least some of which are unsaturated by passing the hydrocarbon feedstock at 200° to 400° F through a contacting zone countercurrent to HF vapour at a higher temp within the range 300° to 500° F and maintaining the pressure in the contact zone between 200 and 1200 p.s.i.

U.S.P. 2,593,584 (1.12.48; 22.4.52), C. S. Lynch, assr to Standard Oil Development Co. Reforming hydrocarbon gases by contacting a mixture of the gas and an oxidizing gas containing a major proportion of CO_2 with a magnesia catalyst at 1400° to 1800° F.

U.S.P. 2,594,706 (30.5.49; 29.4.52). M. L. Allan, assr to I.C.I. Ltd. Isomerizing allene to methyl–acetylene by contacting allene at 240° to 300° C with alumina treated prior to use with SiF_4 or F. R. C. R.

Chemical and Physical Refining

106. Refining of petroleum distillates (processing methods). W. Geistert. *Erdöl u. Kohle*, 1952, **5**, 593–6.—Brief elementary description of the usual refining processes applied to pet distillates, from gasoline through to lub oils. V. B.

107. Patents. U.S.P. 2,592,523 (21.8.48; 15.4.52). G. W. Ayers, M. J. Geerts and W. A. Krewer, assrs to The Pure Oil Co. Recovering weakly acidic sulphur compounds from hydrocarbons by contacting the hydrocarbon with an amine–resin reaction product having amine groups attached to resin molecules through alkoxy chains.

U.S.P. 2,593,128 (6.5.48; 15.4.52). R. H. Felter, assr to California Research Corpn. Recovering sulphuric acid from acid sludges formed in petroleum refining and containing above 80% by wt of acid by cooling the sludge to between 0° and 32° F to produce a solid phase containing above 93% acid.

U.S.P. 2,593,464 (27.12.50; 22.4.52). J. H. Krause, assr to Standard Oil Co. Sweetening hydrocarbons by contacting the oil with a catalyst comprising an inert adsorbent, copper fluoride, and at least 8% of water at 190° to 230° F in the presence of oxygen.

U.S.P. 2,593,619 (19.7.50; 22.4.52). J. O. Smith and A. R. Jones, assrs to Standard Oil Development Co. Treating gasoline with a small amount of an alkyl oxalate in the presence of a small amount of an alkali alcoholate to reduce engine deposit formation.

U.S.P. 2,593,761 (21.2.50; 22.4.52). W. W. Johnstone, assr to Universal Oil Products Co. Reducing the mercaptan content of sour petroleum distillate by treatment with tertiary butyl hydroperoxide or cumene peroxide.

U.S.P. 2,593,851 (20.3.48; 22.4.52). R. H. Cool, assr to Cities Service Refining Corpn. In the methanol/aqueous caustic soda process for sweetening hydrocarbon oils the improvement consisting in separating mercaptans and dissolved hydrocarbons from the methanol–caustic soda and recycling 50 to 90% of the separated material to the initial hydrocarbon treatment stage.

U.S.P. 2,594,311 (23.4.49; 29.4.52). A. B. Johnson and D. H. Condit, assrs to California Research Corpn. Removing carbonyl sulphide from petroleum hydrocarbon gases by treatment with an aqueous solution of alkali metal hydroxide and monoethanolamine.

U.S.P. 2,594,880 (1.11.49; 29.4.52). H. R. Davis, assr to The Lummus Co. Purifying oils by contacting an oil at 300° to 650° F with a clay catalyst fluidized by an inert gas. R. C. R.

U.S.P. 2,599,449 (16.5.45; 3.6.52). J. Happel and S. P. Cauley, assrs to Socony-Vacuum Oil Co. Inc. Alkali solution which has been used to extract sulphur compounds from hydrocarbon oils is reactivated by contacting with oxygen in presence of an aromatic compound containing 3 hydroxyl groups attached in adjacent positions to the same benzene ring.

U.S.P. 2,600,328 (7.6.48; 10.6.52). F. C. Riesenfeld and H. D. Frazier, assrs to The Fluor Corpn Ltd. Hydrocarbon gas containing hydrogen sulphide and carbon dioxide is contacted with a single phase liquid mixture of an alkanolamine, water, and a monohydric alcohol or a water-soluble ether of a polyhydric alcohol, the last component being in a sufficiently high concentration to cause formation of two liquid phases, one containing the amine–carbon dioxide reaction product, and the other the amine–hydrogen sulphide reaction product, separately stripping the two phases and returning the stripped liquids to the contacting zone.

U.S.P. 2,600,465 (14.2.46; 17.6.52). D. C. Bond, assr to The Pure Oil Co. Hydrocarbon oils containing acidic sulphur compounds are contacted with an oxidizing

agent in presence of an alkali solution containing a dihydroxy alkoxy benzene in which the hydroxy groups are adjacent.

U.S.P. 2,600,537 (18.2.50; 17.6.52). E. M. Honeycutt, assr to Sun Oil Co. Residual oils containing alkali metal naphthenates are mixed with aqueous propyl alcohol and saturated hydrocarbons in the C_5 to C_{10} range, the alcohol phase separated from the oil phase (A) and counter-currently contacted with saturated hydrocarbons in the C_5 to C_{10} range and acidified to yield a hydrocarbon phase (B) containing naphthenic acids and an aqueous alcohol phase which are separated. De-ashed oil and naphthenic acids are obtained by vaporizing the solvent from phases (A) and (B).

U.S.P. 2,600,621 (3.8.49; 17.6.52). N. Frazer and R. M. Alm, assrs to Standard Oil Co. Purified cresols are recovered from caustic solutions used in petroleum refining by acidifying to a pH of 9·4 to 10·8, removing the organic phase, further acidifying the organic phase to a pH of 7·5 to 9·0, adding water, and separating the organic phase. This treatment is preliminary to the usual oxidn and distillation steps.

U.S.P. 2,600,671 (18.10.49; 17.6.52). S. Miron, assr to Pan American Refining Corpn. Tar-containing mineral oils are refined by contacting with liquid HF at 375° to 450° F under sufficient pressure to maintain the HF liquid, and separating into a tar phase, an oil phase, and an HF phase.

U.S.P. 2,600,931 (29.8.50; 17.6.52). W. A. Slater, assr to Gulf Oil Corpn. Desulphurizing high sulphur crude oils by contacting the oil with iron, nickel, cobalt, or an oxide thereof at elevated temp and pressure in presence of hydrogen, terminating the contacting before any substantial amount of hydrogen sulphide is formed, topping the desulphurized product to remove gasoline and other light components, and catalytically cracking the residue. J. M. S.

Ger.P. 843,457, 15.5.52. J. W. Le Nobel, assr to N.V. Bataafshe Petroleum Mij. Process for refining petroleum and coal tar distillates. (Prior. Holland 14.4.49.)
BrennstChemie, 1952, **33** (11–12). R. T.

Special Processes

108. Petroleum chemicals at Wilton works. J. W. Woolcock. *Petrol. Times*, 17.10.52, **56**, 867.—A description of the olefin plant at the Tees-side Wilton works of I.C.I. Ltd. is given. Pyrolysis, gas separation, and gasoline treatment are dealt with. G. A. C.

109. Wilton works. V. S. Swaminathan. *Petrol. Engr*, Oct. 1952, **24** (11), C27–34.—The use of petroleum products is described for the production of ethylene by catalytic cracking at the Wilton works of I.C.I. Ltd., and the subsequent conversion of ethylene to plastics, detergents, dyestuffs, and other usable products is outlined. The growth of the Wilton works on its 2000-acre site is detailed, together with the operation of the neighbouring Billingham works. E. K. J.

110. Production of ammonium sulphate and refinery waste. E. D. Fox. *Oil Gas J.*, 6.10.52, **51** (23), 113.—A process is described developed by General Petroleum Corpn for application at its Torrance, Calif, refinery, using waste acid sludge and waste ammonia with resultant formation of ammonium sulphate.

Acid sludge originates from various acid refinery processes and ammonia bearing stream from wastes from decokers, T.C.C. units, etc. H_2S from the reaction is converted catalytically to sulphur. An oil separator, crystallizer, centrifuge, and dryer are essential units. A flow sheet is given. G. A. C.

111. New urea synthesis process. W. F. Bland. *Petrol. Process.*, 1952, **7**, 1457–60.—A new process, known as the "Inventa" synthesis, developed in Switzerland, is now used in the U.S. and Canada for urea manufacture. The important features of the process are the complete recycle of unconverted gases, ammonia, and carbon dioxide, by means of an absorption–desorption system, use of new corrosion resistant alloys, improvements in crystallization techniques, and improved steam economy.

The usual process for urea synthesis is the combination of liquid CO_2 and ammonia under pressure, and at an elevated temp to form ammonium carbamate and subsequently urea. In other urea synthesis there exist two major problems; that of the corrosiveness of the liquid CO_2 and ammonia mixture, and the difficulty in separating efficiently the unreacted gases from each other.

The composition of the non-corrosive alloys have not been disclosed, and little is stated about the absorption–desorption system. Diagrams and full descriptions of the synthesis and recycle sections of the new process are given. J. W. H.

112. Synthesis of ammonia at low pressure. L. B. Hein. *Petrol. Process.*, 1952, **7**, 1462–7.—Of the synthetic ammonia produced in the U.S., 70% is made by low pressure processes; that is between 130 and 350 atms. There are five important commercial processes using low pressure in the ammonia industry, and these are reviewed. As the synthesis converter is the heart of any ammonia plant, careful consideration to such factors as the arrangement of heat exchangers, so that the gas flow maintains an optimum catalyst temp, and the use of construction materials capable of withstanding pressures, high temp, and chemical attack must be made in the converter design. Ammonia synthesis converters may be considered to be of two types; one employs layers of catalyst with means of cooling the gases between the layers, and in the other the gas flow and heat exchangers are so arranged as to minimize temp differences in the catalyst. In the first class is the Fauser–Montecatini converter, and in the second the Nitrogen Corpn and Mont-Cenis converters. The NEC and TVA type converters are also described in detail.

The most widely used catalyst for ammonia synthesis is one of iron promoted with aluminium and potassium oxides (1 to 3% Al_2O_3, and about 1% K_2O).

The materials of construction for the heat exchangers within the converter, although subjected to high temp and pressure, do not suffer much stress due to pressure, because the materials are surrounded by gas at a high pressure. Hydrogen and nitrogen attack is prevalent unless the metal has a low carbon content and contains chromium. J. W. H.

113. Patents. U.S.P. 2,598,953 (30.9.48; 6.3.52). A. W. Weitkamp and N. J. Bowman, assrs to Standard Oil Co. Separating a monomethyl-branched carboxylic acid (A) from a mixture thereof with a more highly branched organic acid (B), by esterifying the mixture with a primary monohydric straight chain alcohol, contacting the product with urea, withdrawing a solid-adduct of urea and the ester of (A) substantially free from the ester of (B), decomposing the adduct and hydrolysing the ester.

U.S.P. 2,599,981 (22.12.49; 10.6.52). W. C. Ekholm, assr to Columbian Carbon Co. Carbon black is manufactured by blasting into one end of an elongated cylindrical chamber a mixture of fluid hydrocarbon fuel and air in a direction substantially tangential to the inner wall of the chamber, burning the mixture at a temp $>$ that at which the hydrocarbons are decomposed to form carbon black, injecting a stream of hydrocarbons into the burning mixture at a point downstream from the point of entry of the combustible mixture, cooling, and separating the carbon black produced from the injected hydrocarbons.

U.S.P. 2,600,054 (Netherlands 17.11.43; 10.6.52) J. T. Hackmann, assr to Shell Development Co. Oxygen is passed into a solution of a saturated aliphatic aldehyde and an olefinic hydrocarbon at $-80°$ to 60° C in presence of a reaction initiator to yield glycol esters.

U.S.P. 2,600,379 (9.11.45; 17.6.52). T. F. Doumani and R. F. Deering, assrs to Union Oil Co. Dehydrogenation catalysts are prepared by impregnating a porous supporting material with an aqueous solution of a salt of a Group VIII metal, heating to decompose the salt to the oxide, decomposing ethylene thereon to produce a carbon deposit, and reducing the oxide to the free metal with hydrogen.

U.S.P. 2,600,399 (11.7.47; 17.6.52). W. G. Frankenburg and E. T. Layng, assrs to Hydrocarbon Research Inc. In the Fischer–Tropsch process the gas mixture treated contains more than 15 mol % of carbon monoxide and less than 2 mol % of water vapour and complies with a specified equation.

U.S.P. 2,600,444 (20.7.46; 17.6.52). F. W. Sullivan. Oxidn of olefins in presence of a fluidized catalyst.

U.S.P. 2,600,452 (1.7.47; 17.6.52). A. Voorhies, assr to Standard Oil Development Co. The products of the Fischer–Tropsch process are heated in presence of a spent alumina–silica cracking catalyst.

U.S.P. 2,600,994 (6.11.44; 17.6.52). J. C. Krejci, assr to Phillips Petroleum Co. Carbon black process and apparatus.

U.S.P. 2,601,075 (15.11.48; 17.6.52). J. E. Wicklatz and J. N. Short, assrs to Phillips Petroleum Co. 1 : 2-Dimethylene*cyclo*hexane is made by condensing 1 : 3-butadiene with maleic anhydride, hydrogenating the resulting tetrahydrophthalic anhydride to hexahydrophthalic anhydride, esterifying to the diethyl ester, reacting the ester with sodium in the presence of ethanol to produce 1 : 2-bis(hydroxymethyl)-*cyclo*hexane, reacting this with iodine in presence of phosphorus to produce 1 : 2-bis-(iodomethyl)*cyclo*hexane, and dehydrohalogenating this to produce 1 : 2-dimethylene-*cyclo*hexane.

U.S.P. 2,601,121 (29.4.48; 17.6.52). W. J. Mattox, assr to Standard Oil Development Co. Iron catalyst, for use in hydrocarbon synthesis in a fluidized form, is preconditioned by subjecting it in a fluidized bed to a gas containing H_2 and CO at 500° to 900° F, whereby a substantial proportion of iron carbide is formed and the catalyst is partially fragmented to particles too small for fluidization, which particles are removed from the bulk of the catalyst. J. M. S.

Ger. P. 841,588, 30.4.52. H. Petri, assr to Farbwerke Höchst. Process for thermal chlorination of methane and methyl chloride in the gas phase.

Ger. P. 844,738, 29.5.52. L. Raichle and A. Wegerich, assrs to Bad. Anilin- & Soda-Fabr. Process for dissociation of mixtures of *iso*butyl and methyl alcohol.

Ger.P. 844,739, 29.9.52. P. van Spijker and M. Hart, assrs to N.V. Bataafsche Petroleum Mij. Method for production of hydrocarbons containing oxygen. (Prior. Holland 26.1.50.)

Ger.P. 843,848, 21.5.52. H. Nienburg, H. Häuber, and W. Hagen, assrs to Bad. Anilin- & Soda-Fabr. Method for production of compounds containing oxygen.

Ger.P. 843,849, 21.5.52. P. G. Harvey and S. A. Lamb, assrs to I.C.I. Ltd. Method for production of compounds containing oxygen.

Ger.P. 841,447, 30.4.52. H. Pollack, assr to A. G. f. Stickstoffdünger. Process and plant for production of graphitic carbon.

Ger.P. 841,448, 30.4.52. J. Schmidt, assr to Carl Still. Process and plant for conversion of ammonium sulphide in water solution to ammonium sulphate.

Ger.P. 844,001, 21.5.52. E. Donath and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Method for production of low-boiling aromatic hydrocarbons.

Ger.P. 841,587, 30.4.52. O. Reitz and W. von Füner, assrs to Bad. Anilin- & Soda-Fabr. Purification process for crude benzole or medium and heavy benzole.

Ger.P. 844,002, 21.5.52. O. Klopfer, assr to Bad. Anilin- & Soda-Fabr. Process for recovery of pure aromatic hydrocarbons from mixtures with non-aromatic hydrocarbons.

Ger.P. 844,142, 21.5.52. Bad. Anilin- & Soda-Fabr. Method for producing petrol. *BrennstChemie*, 1952, **33** (11–12).

Ger.P. 847,590, 26.6.52. K. Bayerlein and F. Strauss, assrs to F. J. Collin A.G. Process and installation for purifying sulphur–carbon disulphide solutions containing tar.

Ger.P. 848,646, 3.7.52. P. Feiler, assr to Bad. Anilin- & Soda-Fabr. Method for producing carbon disulphide and organic sulphur compounds. (Addn to Pat. 803,114.)

Ger.P. 845,498, 5.6.52. P. Stoller, assr to F. J. Collin A.G. Process for separating hydrogen sulphide and carbon dioxide from scrubber solutions containing ammonia.

Ger.P. 845,502, 5.6.52. H. W. Gross, assr to Metallges A.G. Method for production of hydrocarbons.

Ger.P. 845,799, 11.6.52. E. Donath, H. Nonnenmacher, E. Rotter, G. Treuge, and H. Welz, assrs to Bad. Anilin- & Soda-Fabr. Method for producing low-boiling aromatic hydrocarbons.

Ger.P. 848,359, 3.7.52. W. E. A. Simon, assr to Deutsche Werke Kiel A.G. Method for obtaining polymerizable humic acid.

Ger.P. 847,001, 19.6.52. G. Free, assr to Bad. Anilin- & Soda-Fabr. Method for producing gaseous, unsaturated hydrocarbons, especially ethylene, also aromatic hydrocarbons. Addn. to P. 840,237.

Ger.P. 845,942, 11.6.52. A. Schmalenbach, assr to H. Koppers G.m.b.H. Process for recovering phenols from waters, *e.g.*, ammonia water.

Ger.P. 845,089, 5.6.52. W. Krönig, assr to Bad. Anilin- & Soda-Fabr. Process for obtaining liquid hydrocarbons from asphaltene.
BrennstChemie, 1952, **33** (13–14). R. T.

Metering and Control

114. Control system for first Platformer–Udex unit. H. M. Martin. *Petrol. Engr*, Sept. 1952, **24** (10), C44–6.—The Eastern States Petroleum Co. plant at Houston is controlled through the four process variables, temp, pressure, hydrogen recycle, and space velocity. Temps are measured by potentiometers, and the other variables are transmitted pneumatically to the controllers set in a conventional panel. E. K. J.

115. Instrumentation vital to processing. W. C. Uhl and E. F. Gibbons. *Petrol. Process.*, 1952, **7**, 1433–4.—The significance and importance of automatic control in the chemical industry are discussed and summaries of various technical papers of interest presented at the 7th National Conf. and Exhibit of the Instrument Soc. of America, 8–12 Sept. in Cleveland, are given. Sales in the chemical industry have increased sixfold during the past ten years; this fact transpired during a panel discussion on " Frontiers of instrumentation " at the above conference. J. W. H.

116. Electronic measurement and control in industry. H. J. Lindenhovius. *Ingenieur, 's Grav.*, 26.9.52, **64** (39), O117–24.—After a discussion of the general characteristics of transducers, a survey is given of the electronic measuring methods themselves. The main features of the two fundamental methods, *i.e.*, the direct-reading and the bridge or compensation method, are discussed. The direct-reading bridge instruments were developed in an attempt to combine the advantages of both methods, and have found an enormous field of application in industrial practice. A number of usual control-methods (on–off, floating, proportional, integral, derivative), their main properties and fields of application, and the various ways of their electronic realization are discussed. Twenty illustrations and graphs are included.
G. F. T. C.

117. How to train an instrument man. J. A. Parker. *Oil Gas J.*, 22.9.52, **51** (20), 129.—Selection and qualification of instrument engineers are discussed, and training courses outlined. The training of non-technical personnel and common fallacies of instrument operation are dealt with. G. A. C.

118. How to detect column flooding. G. W. Swinney. *Petrol. Process.*, 1952, **7**, 1469–71. (*Nat. Instrument Conf., Cleveland, Ohio*, Sept. 1952.)—The use of fractionators making accurate and close separations of hydrocarbons to a high percentage of purity has created the necessity for sensitive control systems. But a means of anticipating and detecting column flooding is still lacking, and this prevents safe operation at max load for greatest economy. Any change in pressure drop will indicate a change in the internal condition of the column to the operator. A gradual increase in pressure drop means the column is approaching the flood stage, and operating conditions should be changed accordingly.

A means recently used for operation improvement is a force-balanced-type pressure transmitter that measures the pressure drop across the trays. This instrument is capable of measuring a narrow pressure span of 0·2 to 0·4 p.s.i.g., and is very adaptable to easy installation. J. W. H.

119. Automatic gas analyser pays off. K. V. Kratochvil and D. E. Berger. *Petrol. Process.*, 1952, **7**, 1294–9. (*Nat. Instrument Conf., Cleveland, Ohio*, 8–12 Sept. 1952)—In order to maintain the catalyst at a high degree of activity in the production of butadiene by dehydrogenation of normal butylenes, the temp of regeneration is used as a guide for correct "burn out" conditions. Near the end of the cycle a more sensitive method is required, and the need for this is met by the use of an infra-red analyser to monitor the CO_2 content of the effluent gas.

Continuous and highly accurate CO_2 analysis, particularly at low concentrations, is recorded on a 100-division linear strip chart by this analyser, which is a double beam differential photometer type.

Changes in infra-red energy are received by a bolometer, and the telemetered signal can be transmitted several thousand feet.

The design of the sampling system is also discussed, and a schematic wiring diagram is given. J. W. H.

120. A total vaporization method. S. T. Preston. *Petrol. Engr*, Sept. 1952, **24** (10), C34–6.—The determination of equivalent vapour vols of pentane plus fractions for interrelating liquid and vapour bases in plant material balances can be carried out using apparatus consisting of liquid measuring pipette, multiplying manometer, and vaporization bulb. The calculating method is outlined, and accurate, reproducible results are obtained. E. K. J.

121. "Hot atoms" measure liquid level. D. P. Thornton. *Petrol. Process.*, 1952, **7**, 1286–8.—A new type liquid level and interface controller, called a Gagetron, is described. This radioactive type instrument is used on corrosive materials in process control on an HF alkylation unit. In this application both temps and pressure are high (300° to 400° F, 100 to 150 p.s.i.).

In one case there were seven sources (radium salt $RaCl_2$ being used) located equidistant from each other along the vertical dia of the tank.

The radiation intensity is measured by the detector, consisting of a Geiger counter-tube and pre-amplifier assembly. The pre-amplifier magnifies the signal from the Geiger tube, the intensity of which is directly proportional to the intensity of radiation it receives, and transmits it to the plant control room.

Maintenance on the instruments has been satisfactory, considering the lack of experience with this type of electronic apparatus. One important factor to be considered is the safety of personnel from "burning"; this can be reduced to a min by adequate shielding. J. W. H.

122. Automatic tank gauging facilitates terminal operations. C. C. Roberts. *Oil Gas J.*, 10.11.52, **51** (27), 144.—The installation is described of Esso Standard Oil Co. at Wilmington, N.C. Here an electrical system of tank gauging is used. G. A. C.

123. Making good use of pressure-actuated switches in continuous slurry make-up control. W. B. Simon. *Oil Gas J.*, 29.9.51, **51** (21), 313.—No. 140 in the Refiner's Notebook series describes a system and instrumentation for a continuous make-up of a constant-density slurry at a variable rate as demanded by the use of the slurry within the process as in mixing of chemicals for water treatment. G. A. C.

124. Electro-chemical theory of pH measurement. C. Chalmers. *Instrument Engineer*, Oct. 1952, **1** (2), 23–8.—The theory of ionization is presented, relating the characteristics of aqueous solutions to the activities of the resultant ions. It is explained that acidity depends on the unique atomic structure of hydrogen, and the influence of the hydrogen ion activity on solutions of electrolytes is outlined. The advantages of expressing hydrogen ion activities in terms of pH values are indicated, and the method of estimating acid characteristics from a knowledge of the chemical composition of the solution is described. In the measurement of pH it is shown that some disturbance of the measured variable must result and that the electrometric method has the advantage of minimizing this effect. In conclusion, systems of measurement are considered and the precautions necessary for ensuring accurate measurement discussed in relation to the theory of measurement. (Author's Abstract.) W. H. C.

125. Estimating the rating of industrial water and steam flow meters. J. Tham and C. W. Terry. *Instrument Engineer*, Oct. 1952, **1** (2), 28–30.—Flow meters operating on the differential-pressure principle have a limited flow range, and must therefore receive careful estimation of max and min flow conditions in order that they should give accurate results and reliable service. The various factors which influence the choice of max ratings are discussed and suggestions are made as to how such factors might be allowed for in the flow-rating assessment. W. H. C.

126. Instrumentation and waste disposal. J. G. Dobson. *Oil Gas J.*, 22.9.52, **51** (20), 141.—No. 139 in the Refiner's Notebook series deals with control of the activated sludge process. A schematic diagram of air to influent and return sludge ratio control is given. G. A. C.

127. Patents. U.S.P. 2,592,798 (11.2.48; 15.4.52). N. Fenger, assr to Aro Equipment Corpn. Liquid control valve.

U.S.P. 2,594,662 (13.12.48; 29.4.52). W. E. Leibing. Metering fuel pump. R. C. R.

U.S.P. 2,598,910 (4.6.47; 3.6.52). V. P. Head, assr to Fischer and Porter Co. Meter for determining flow rate and/or visc of fluids.

U.S.P. 2,599,197 (29.6.47; 3.6.52). N. F. Prescott, assr to Atwood & Morrill Co. Control system for catalytic reactors designed to prevent particles of catalyst gravitating back to the blower.

U.S.P. 2,599,975 (8.11.48; 10.6.52). P. G. Carpenter, assr to Phillips Petroleum Co. Apparatus for measuring velocity of fluids in a pipe or well.

U.S.P. 2,600,039 (17.11.47; 10.6.52). T. H. Whaley, assr to Phillips Petroleum Co. Apparatus for measuring the levels of two liquid phases in a single vessel.

U.S.P. 2,600,158 (6.9.47; 10.6.52). A. T. Clothier, assr to Standard Oil Development Co. Method of analysing gas mixtures to determine the content of hydrocarbons containing 2 to 5 carbon atoms.

U.S.P. 2,601,676 (10.3.50; 24.6.52). R. P. Trainer and L. E. Border, assrs to Shell Development Co. Control of flow of solids from a fluidized bed. J. M. S.

PRODUCTS

Chemistry and Physics

128. Oxidation of petroleum residues. W. Graham, W. J. G. Cudmore, and R. D. Heyding. *Canad. J. Tech.*, **30** (6), 143–52.—Steam refined Lloydminster reduced crude, and cracked stock from Leduc crude, both commercially prepared, were selected for the blowing experiments. The reduced crude had a Saybolt Fural visc of 152 sec at 130° F and the cracked stock, 74·1 sec at 130° F. These residues were blown with oxygen, with nitrogen, and with air, at 200° C and a low blowing rate to facilitate the recovery of distilled oils, water, and carbon dioxide. The change in the quantities of oils, resins, and asphaltenes with oxidn were determined, as well as the oxygen content of these fractions. The oxygen absorbed by the residue was found to be small compared with the oxygen consumed in the formation of water and carbon dioxide. The relative rates of formation of the asphalt fractions are discussed. The marked physical changes accompanying the oxidn of asphalt under the conditions employed may be attributed to dehydrogenation and polymerization of particular asphalt molecules. S. B.

129. Vapour phase oxidation of hydrocarbons. II. Effect of hydrocarbon and oxygen concentrations in the low temperature oxidation of *n*-heptane. A. Fallah, R. Long, and F. H. Garner. *Fuel, Lond.*, Oct. 1952, **31** (4), 403–8.—The low temp oxidn of *n*-heptane below 450° C is a composite process with two distinct maxima and minima visible in the curves obtained by plotting peroxide and total aldehyde and ketone concn, respectively, against temp of oxidation. At the temp corresponding to the first peak, if either the oxygen–nitrogen ratio or the hydrocarbon–oxygen + nitrogen ratio (for a

fixed hydrocarbon ratio) is varied, a max occurs in the peroxide curve. Beyond the max the peroxide concn is practically independent of the oxygen–nitrogen ratio (for a fixed hydrocarbon concn) when oxygen is in excess. The peroxide concn rises steeply with increase of the hydrocarbon–oxygen + nitrogen ratio (for a fixed oxygen concn), and then falls when the hydrocarbon is in excess. At the temp corresponding to the second peak there is no max in the peroxide curve but a steady increase as the two ratios are increased. The difference in behaviour between the two peaks in the low temp region with regard to the effects of surface and of hydrocarbon and oxygen concn is probably due to the nature of the chain-breaking reactions which are operative. (Authors' Abstract.) W. H. C.

130. Gas phase oxidation of ethylene on silver catalysts. G. R. Schultze and H. Theile. *Erdöl u. Kohle*, 1952, **5**, 552–60.—Conditions governing production of ethylene oxide were investigated in detail; cat used was Ag_2O with, in most cases, admixture of BaO_2, deposited on corundum. Ethylene was used 98% pure, oxidn agent air, reaction vessel heated in salt bath in temp range 215° to 289° C, gas veolocities 5 to 68 cm/sec, careful measurement of temp distribution along the cat layer being made. Full experimental details of apparatus, procedure, and analytical methods are given. Max conversion of C_2H_4 to C_2H_4O was 73%. At high initial temp and gas velocity a considerable temp rise (as high as 300° C) occurs on the cat; this favours formation of CO_2 and H_2O. By reducing activity of front part of cat layer a more suitable temp distribution is obtained and complete oxidn of C_2H_4 minimized. Reaction products formed, especially H_2O, inhibit C_2H_4 oxidn. Significant temp governing reaction is not that of gas stream but surface temp of cat. V. B.

131. Thermodynamics of carbon monoxide : Aldehyde fission. W. Fuchs, E. Gavatin, and H. E. Homig. *Erdöl u. Kohle*, 1952, **5**, 624–8.—Kinetics of reaction $RCHO \rightarrow RH + CO$ (catalysed by Si gel or Ni) are discussed, and equilibrium const for several aldehydes are calc. Only at low temp (*ca* 25° C) and high pressure (100 atm) are appreciable aldehyde concn to be found at equilibrium. V. B.

132. Thiaadamantane. S. F. Birch, T. V. Cullum, R. A. Dean, and R. L. Denyer. *Nature, Lond.*, 1952, **170**, 629.—A solid sulphur-containing compound was obtained during the vacuum distillation of the kerosine fraction of a Middle East crude oil. It had the empirical formula $C_9H_{14}S$, and its m.p. was 320° C with decomposition. Its chemical reactions suggest that it is a doubly bridged *cyclo*paraffin with a S atom forming one bridge. Its basic structure resembles that of adamantane, for upon desulphurization with Raney Ni it yields bi*cyclo*-1 : 3 : 3-pentane.

A structural formula for the compound is suggested. H. C. E.

133. Effect of withdrawal rate on second explosion limits. A. C. Egerton and D. R. Warren. *Nature, Lond.*, 1952, **170**, 420.—The effect noted by Baldwin and Precious (cf. Abs. 1427–52) is also obtained at higher temps in tubes coated with KCl or KOH, and has been observed with CO–O_2 as well as H_2–O_2 mixtures. In the H_2–O_2 reaction explosion will not occur even below the explosion limit if the withdrawal rate is sufficiently small, but if (below the limit) the rate is suddenly increased, then explosion follows within 0·5 to 3 sec. With moist CO–O_2 mixtures the presence of a slow reaction is indicated by a blue glow, the intensity of which can be varied by altering the withdrawal rate. These observations suggest that the net branching factor can be reduced to zero by the products formed during the initial stages of the explosion. The transition from slow reaction to explosion is not a true discontinuity and, for H_2–O_2 mixtures, the water initially formed may suppress any subsequent development to explosion. H. C. E.

134. Measurement of the water vapour permeability of packing materials. P. R. Bange. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (6), 158–60 (abs. from *TNO Niews*, 1952, **71**, 75).—Brief observations on water vapour diffusion and its estimation are presented. Methods described are gravimetric, dynamic, manonometric, and hygrometric with explanatory diagrams. Measurements <10 g/m²/24 hr require special procedure in an air-conditioned room. R. T.

135. Spreading of liquids on low-energy surfaces. III: Hydrocarbon surfaces. H. W. Fox and W. A. Zisman. *J. Colloid Sci.*, 1952, **7**, 428–42.—Contact angle measurements have been made between smooth surfaces of polyethylene, paraffin, of single crystals of *n*-hexatricontane (I) and the following liquids: *n*-alkanes, di(*n*-alkyl) ethers, *n*-alkyl benzenes, esters, halogen compounds, as well as water, glycerol, etc. The spreading coeffs, free energy of immersion (f), and work of adhesion have been calculated.

The methyl-rich surfaces of (I) and paraffin are not wetted by many organic liquids, including *n*-alkanes. Wettability decreases in the order polyethylene, paraffin, (I), which is attributed to the increase in the prop of CH_3 to CH_2 groups in the surface. It is stated that many of the variations of the hydrophobic contact angle on paraffin found in the literature are attributable to variations in the CH_3/CH_2 ratio in the surface.

Adhesion of liquids to hydrocarbon surfaces increases in the order: oxygen- or fluorine-containing compounds, aliphatic hydrocarbons, aromatic hydrocarbons. Variation of f of the *n*-alkane series of liquids on a given hydrocarbon surface is the resultant of two opposing tendencies: increased adhesion due to increase in the CH_2/CH_3 ratio in the liquid, and decreased adhesion due to increase in σ of the liquid. For the (I) surface the latter tendency predominates; for the paraffin surface the former tendency predominates. H. C. E.

136. Patent. Ger.P. 844,362, 29.5.52. R. Vieweg, Darmstadt, and A. Wesp, Messenhausen. Electrical viscometer for any liquids.
BrennstChemie, 1952, **33** (11–12). R. T.

Analysis and Testing

137. Physical properties of important petrochemical materials. Anon. *Oil Gas J.*, 20.10.52, **51** (24), 173.—Tables list hydrogen and carbon content, b.p. R.v.p., latent heat of evaporation, f.p., heating valve, sp. gr., B.Th.U. and wt per U.S.G. of many petrochemicals. G. A. C.

138. How to save time analysing lube oils for metal additives. H. D. Veldhuis, S. Cohen, and G. A. Nahstoll. *Petrol. Process.*, 1952, **7**, 1311–13.—An accurate spectrochemical method made in less than ½ hr, by making the oil sample homogeneous, placing it in a hollow carbon rod, sparking in the conventional manner, and microphotometering the suitable lines is presented. The unusual step in the procedure being to absorb the oil in a filter-paper disk which is inserted in the other end of the carbon rod.

The spectrograph used is one with a 1½-m grating, spectrum range 2200 to 4200 Å, and slit width 45 μ. J. W. H.

139. Analysis of crude shale oil. R. F. Stevens, G. U. Dinneen, and J. S. Ball. *Rept. Invest. U.S. Bur. Min.*, 4898, Aug. 1952, 20 pp.—A laboratory method, adapted from the Bureau of Mines, for the examination of crude shale oil. The method investigates the relative instability of shale oil towards heat and its high content of unsaturated hydrocarbon, nitrogen, oxygen, and sulphur compounds.

Results of twenty crude shale oils are described and tabulated. The oils were from seven countries: ten from the U.S., four from France, two from Sweden, and one each from Spain, South Africa, Australia, and Scotland. The American oils were produced from different methods of retorting and the remainder from commercial scale operations in those countries. G. S. S.

140. Determination of foreign matter in lubricants. H. Umstätter. *Erdöl. u. Kohle*, 1952, **5**, 650.—Draft German standard DIN 51592 is reproduced. Applicability is to lub oils and greases. Procedure is dissolution in pure C_6H_6 (for oils) or 90% C_6H_6 10% C_2H_5OH (for greases) (up to 20% C_2H_5OH is permitted when grease is difficultly soluble) and filtration through a cryolite-packed grade 4 sintered glass filter. Residue on filter is washed with hot solvent and also (for greases) with hot water. Accuracy ±0·05%. V. B.

141. Determination of the oxygen content of coals. H. Schöberl. *BrennstChemie*, 1952, **33** (13–14), 241–4.—The difference method for estimating org-CO_2 in coal is preferred generally. Four direct methods are given, ideal for pure org substances, but yielding high results for true org-O_2 in coal, as shown by quant analytical examples. Two reliable methods are given : (1) the true cont of mineral constituents is determined and, using the difference method, the carbonate-CO_2 is taken into account in the elementary analysis, but the H_2O of hydration is ignored ; (2) O_2 is determined by a conventional direct method and corrections are applied for carbonate CO_2,H_2O of hydration and atm-O_2 taken up by the ash. R. T.

142. Cut phenols in waste by 99·9%. J. A. Biehl. *Petrol. Process.*, 1952, **7**, 1435–7. (*Industrial Waste Conf, Purdue University, Lafayette, Ind., May* 1952.)—Data obtained from laboratory tests using a five stage Scheibel multi-stage fractional liquid–liquid extraction unit indicate a possible reduction of 99·9% in the 220 p.p.m. phenol content (down to 0·2 p.p.m. phenols) of a waste accumulator water from catalytic cracking operations. The solvent used consists of a mixture of aromatic and paraffinic hydrocarbons, containing 75% aromatics, and is sent through the column at a ratio of two parts solvent to one part waste water. The solvent was made in the laboratory by blending 66% benzole with 34% of fluid cracked gasoline. A suggested flow diagram for a commercial unit is given.

The Scheibel column operates with gravity feed, and the counter-current flow of solvent and waste are mixed by motor driven paddle wheels having wire gauze settling spaces or zones between each. Five operational factors, such as solvent types, solvent ratios, required stages, solvent regeneration, and solvent loss, are briefly studied. The percentages of phenol removed with various solvent ratios and extraction stages are also given. J. W. H.

143. Save time in T.E.L. analyses. H. W. Kellogg, E. F. Mahlke, and J. T. Jones. *Petrol. Process.*, 1952, **7**, 1430–2.—Because of the slowness of standard chemical methods for the determination of T.E.L. in gasoline owing to the need of digesting the sample and evaporating the extract, a rapid and accurate method for determining T.E.L. content by a photometer has been developed and is described. A General Electric X-ray photometer is used in conjunction with a semi-automatic sample weighing apparatus. The photometer detects differences in X-ray absorption of the sample compared with a standard ; this absorption varying with the atomic No. and amounts of elements present in the sample.

The photometer compares X-ray energy in each half of its beam at a rate of thirty times per sec. The source of radiation is a tungsten target tube operating up to 46 kV. Intensity comparison is made on a null-meter instrument with the use of a phase detector. Test time is approx 10 min.

T.E.L. content of 210 different gasoline samples determined by the photometer was compared with the chemical method. Details of the results are given in tabular form. Test procedure and optimum operating conditions are discussed in detail, and diagrams of the weighing apparatus and electrical circuits are given. J. W. H.

144. Air-cooled metal probe for the investigation of the corrosive nature of boiler flue gases. G. G. Thurlow. *J. Inst. Fuel*, 1952, **25**, 252.—The temperature-controlled mild-steel probe described was developed to obtain more direct information on the mechanism of acid deposition and attack on metal surfaces. Tests were made on four boiler plants ranging from a chain-grate-fired boiler on which severe air-heater corrosion occurred to plants where the gases contained no or very little sulphuric acid. The test procedure is described, and results are graphed and tabulated. A general relationship between the weight of the acid condensed and amount of iron corroded is indicated by the results. A peak in the rate of corrosion occurs 50° to 100° F below acid dew point. Results are in agreement with those obtained by other methods. D. K.

145. Automatic heat point instrument. R. B. Jacobs. *Oil Gas J.*, 10.11.52, **51** (27), 124.—The machine determines whether or not a sample of oil will flash at a predetermined temp. Measurement is accurate, and requires only 2½ min to perform.

G. A. C.

146. Developments in the BCURA dew-point meter, for the measurement of the rate of acid build-up on cooled surfaces exposed to flue gases. P. F. Corbett, D. Flint, and R. F. Littlejohn. *J. Inst. Fuel*, 1952, **25**, 246.—A survey is reported, covering the period January 1945–June 1946, of the dew-point characteristics of eighteen boiler installations in various parts of the U.K. Types of boiler tested were retort-fired, pulverized fuel-fired, and chain-grate fired." Differences were observed in reactions of dew-point meter for flue gases from different boilers. Though the dew-point temp would fix the range where corrosion would occur, the rate of acid build-up determined severity of corrosion.

A new type of dew-point element was developed. Flue gases from various boiler plants and laboratory equipment were examined with the new element. The dew-point was established and rates of build up measured under known conditions. Results are discussed. D. K.

Crude Oil

147. Alberta crude oils. Characteristics and refining problems. C. W. Coote. *Canad. Min. metall. Bull.*, 1952, **45**, 553–4.—The main characteristics are given of the crude oils from the following fields: Leduc–Woodbend, Redwater Excelsior, Turner Valley, Lloydminster, and Stettler. Laboratory data, covering API gravity, type of crude, sulphur and pour point, are recorded for the crude oils from: Acheson, Big Valley, Bantry, Camrose, Conrad, Joseph Lake, Olds, Pincher Creek, and Princess pools. Refiners' problems in connexion with the crudes, desalting, storage, mixing of crudes for processing, below-zero processing, and corrosion, are considered and discussed. W. H. C.

148. Refining properties of new crudes. Pt 7. Crude oil from recent discoveries in Canada. C. M. McKinney and H. M. Smith. *Petrol. Process.*, 1952, **7**, 1270–3.—Tabulated data and analyses of eleven crude oils from nine of the new Canadian oil-fields are discussed.

The O.N. and Cetane Nos of diesel fuels from crude oils obtained from the Leduc and Redwater fields are given. Complete inspection tests provide all physical data necessary. Correlation index curves for two other crudes are compared.

The commercial utilization possibilities of the new crudes are also outlined, and are reviewed with similar products from other crude oils. J. W. H.

Gas

149. Explosive limits of mixtures of natural gas and air. R. F. Nielsen. *Oil Gas J.*, 10.11.52, **51** (27), 167.—No. 502 of Engineering Fundamental series deals with the use of the Le Chatelier equation to calculate explosive limits. G. A. C.

150. Improved methods of ethylene production. P. W. Sherwood. *Erdöl u. Kohle*, 1952, **5**, 628–9.—U.S.A. ethylene consumption was 680,000 tons in 1950, with forecast of 1·8 million tons for 1962. One-third of C_2H_4 is used for production of ethylene glycol, similar quantity for ethanol manufacture, and remainder for styrene, ethylene chloride, etc. Main source is gases from thermal cracking which contain 20 to 25% C_2H_4, whereas gases from cat crackers have about 5%. One plant operates by partial oxidn of 3 : 1 C_2H_6/O_2 mixture at 880° C and 300 to 400 mm; yield 60 to 65%. Most-used process for ethylene concn is low temp dist, other methods are oil-absorption, charcoal adsorption, and absorption in soln of Cu salt. V. B.

151. Patents. Ger.P. 843,546, 21.5.52. Z. de Galoczy, assr to H. Bischoff, Essen (Ruhr). Process for conversion of water-gas.
BrennstChemie, 1952, **33** (11–12).

Ger.P. 846,093, 11.6.52. H. Schmalfeldt, assr to H. Schmalfeldt. Process for scrubbing dust from gases.

Ger.P. 847,944, 26.6.52. H. Koppers, assr to H. Koppers G.m.b.H. Purging process for water-gas producers operating alternately.

Ger.P. 847,047, 19.6.52. F. Totzek, assr to Koppers Co. Generation of carbon monoxide, and if necessary, of gases containing hydrogen from finely divided solid fuels.

Ger.P. 847,320, 26.6.52. O. Judat, assr to H. Koppers G.m.b.H. Process for separating hydrogen sulphide from gases.

BrennstChemie, 1952, **33** (13–14). R. T.

Engine Fuels

152. (French) National motor fuels and their related industries. Anon. *Rev. Pétrolière*, Nov. 1952 (929), 51–123.—This thirtieth anniversary issue gives an extensive survey of the French motor fuel position in relation to world supplies, the country's own resources, and her industrial and agricultural requirements. A short history of the fuels and lubricants industry is included, and also accounts of the Pechelbronn field, the oil from coal, natural gas, and oil shale industries. E. H.

153. Alcohol mixtures as motor car fuels. B. Mielnikowa. *Nafta* (*Krakow*), 1951, **7**, 311–14, 332–7.—A most thorough paper investigating the properties of binary and ternary mixtures of gasoline, benzole or benzene, and pure or commercial ethyl and methyl alcohol with reference to their properties as motor fuels. Considered are the questions of (1) sp. gr.; (2) cal. val. and power; (3) consumption of fuel; (4) O.N., (5) T.E.L. susceptibility; (6) vapour pressure; (7) distillation curves; (8) starting ease; (9) vapour locking; (10) warming up; (11) effect on lubrication; (12) formation of carbon; (13) freezing up; (14) corrosion, and (15) mixture stability. In conclusion, author expresses preference for 1 : 1 : 3 C_2H_5OH, C_6H_6, and gasoline mixture.

Several graphs and tables are included. M. S.

154. How to improve alkylate feed stock for more and better avgas. J. D. Wall. *Petrol. Process.*, 1952, **7**, 1438–43.—The production of aviation gasoline may be increased by raising the quality of the blending stock or by increasing the output of the same quality stock. Improved operation of existing processes can expand the supply of aviation gasoline, although the production is limited by the supply meeting the O.N. specifications. By relating the operating factors on the commercial unit with the O.N. of the alkylate produced, many production problems have been solved.

Sample computations of the O.N. and blending index for an alkylate at various feed distributions are given. The O.N. of a gasoline may be improved by suitably changing such operating variables as reactor temp and acidity. A nomograph connecting these and other variables with the light alkylate O.N. is given, together with the relationship. J. W. H.

155. Jet fuels—small refiners can make them. W. F. Krause. *Petrol. Process.*, 1952, **7**, 1428–9; *Oil Gas J.*, 6.10.52, **51** (22), 93. (*NPA Symposium on jet fuels, Atlantic City, Sept.* 1952.)—The small refining plant has adequate and suitable facilities for the production of many of the grades of jet fuel on the market at the present day. The advantages to be gained by the small refiner in this field of petroleum are many, and are discussed by the author.

Three types of jet fuel are in current production, these are: Referee Jet Fuel, Grade JP-4, and Grade JP-5. Their use and manufacture are briefly described. Discussion on treating, blending, and the handling of jet fuels is given from the small refiner's point of view. J. W. H.

156. Jet fuels—present and future. V. B. Guthrie. *Petrol. Process.*, 1952, **7**, 1425–6. (*NPA Symposium on jet fuels, Atlantic City, Sept.* 1952.)—The need for refiners to be able to meet a sudden increase in jet fuel consumption in the event of a general war, and the present problem of adequate supplies for the Armed Services are discussed. The current demand of jet fuels in the U.S. is estimated to be near the 100,000-b.d. mark. The commercial consumption of aviation gasoline for 1952 is in the region of 20 million brl, with an expected rise to 32 million brl by 1962; the jet fuel demand for 1962 will be at least 4·8 million brl.

Summaries of jet fuel specifications for the Armed Services and their current properties are given. J. W. H.

157. How are jet fuel specs drafted? Anon. *Petrol. Process.*, 1952, **7**, 1427–8. (*NPA Symposium on jet fuels, Atlantic City, Sept.* 1952.)—Under wartime conditions the jet fuel demand will be very high, and max production from refiners will be expected. In order to make this production as high as possible, various quantities of cracked gasolines and cracked fuel oil fractions may be included. For this reason engines designed for wartime use should be able to handle this type of fuel near the limit of the specification. The consideration of logistical and operational requirements for the Armed Services makes the drafting of suitable specifications for jet fuels difficult. J. W. H.

158. Jet fuels. Development of specifications. C. W. Kelley. *Oil Gas J.*, 6.10.52, **51** (22), 96.—A table of jet fuel specifications and notes on other requirements are given. G. A. C.

159. Jet fuels. Aircraft turbine-fuel supply problems. M. F. Granville. *Oil Gas J.*, 6.10.52, **51** (22), 98.—Methods developed to assure sufficient wartime supply are outlined. Wartime fuels are specified, and performance problems discussed. G. A. C.

160. Jet fuels. Fuelling civil aircraft. J. B. Hill. *Oil Gas J.*, 6.10.52, **51** (22), 101.—Volume of jet fuel requirements for the commercial air-liner of the future is predicted. G. A. C.

161. Boiler oil for motor ships. A summary. Anon. *Mot. Ship*, 1952, **33**, 293.—A brief examination is made of the present situation with regard to extent of utilization of boiler oil, financial saving made by its use, its effect on cyl liner wear, and its availability at bunkering ports. U. M.

162. Patents. U.S.P. 2,594,266 (31.12.45; 22.4.52). F. M. Watkins, assr to Sinclair Refining Co. Gasoline containing a small quantity of ammonium mahogany sulphonates as rust-inhibitor. R. C. R.

U.S.P. 2,599,338 (26.5.50; 3.6.52). W. E. Tifsen and G. W. Duncan, assrs to Standard Oil Development Co. Gasoline containing 0·05 to 1 vol % of tetrahydrofurfuryl alcohol.

U.S.P. 2,600,113 (1.6.50; 10.6.52). A. R. Jones and J. O. Smith, assrs to Standard Oil Development Co. Gasoline containing 0·05 to 1 vol % of an aliphatic thioether of a monocarboxylic acid. J. M. S.

Ger.P. 842,991, 15.5.52. M. Pier, E. Donath, and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Process for improving anti-knock properties of gasolines.

Ger.P. 843,456, 15.5.52. H. Welz and W. Barkow, assrs to Bad. Anilin- & Soda-Fabr. Method for production of high anti-knock gasolines rich in aromatics from middle oils rich in aromatics, cleavable with difficulty.

Ger.P. 843,328, 15.5.52. W. Grönwoldt and E. Hasenberg, assrs to W. Grönwoldt, Hamburg. Process and device for raising the O.N. of fuels for gasoline motors. *BrennstChemie*, 1952, **33** (11–12).

Ger.P. 847,144, 19.6.52. M. Pier and E. Donath, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knock-free motor fuels from liquid hydrocarbons.

Ger.P. 848,351, 3.7.52. E. Donath and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knock-free motor fuels.

Ger.P. 846,544, 19.6.52. J. Jannek and F. Blümel, assrs to Bad. Anilin- & Soda-Fabr. Method for producing liquid hydrocarbons suitable for motor fuels.

Ger.P. 845,090, 5.6.52. H. Bähr, assr to Bad. Anilin- & Soda-Fabr. Method for producing fuel oil.

Ger.P. 846,759, 19.6.52. L. Mai. Process for gasification of solid fuels. *BrennstChemie*, 1952, **33** (13–14). R. T.

Gas Oil and Fuel Oil

163. Patents. U.S.P. 2,599,563 (10.11.47; 10.6.52). J. T. Landgrof, assr to H. D. Hudson Manufacturing Co. Vaporizing type oil burner.

U.S.P. 2,600,123 (9.11.48; 10.6.52). J. W. Miller, assr to Motor Wheel Corpn. Fuel control for liquid fuel burners. J. M. S.

Lubricants

164. Friction the main cause of engine wear. Standard Oil Development Co. *Petrol. Process.*, 1952, **7**, 1263–6. (*SAE meeting* 1–6 *June* 1952, *Atlantic City.*)—Friction along with some mild abrasion is found to be the main cause of engine wear; and it is believed that corrosion under low temperature operating conditions is not one of the major contributing factors in cyl and piston ring wear.

Heavy engine deposits (oil ring and oil screen deposits) cause only a small proportion of engine failures.

Radioactive tracer techniques are employed for measuring wear of engine parts. Such new techniques may help to show that some engine wear, as "fretting corrosion," now attributed to corrosion, may in actual fact be caused through friction.

Of the total engines overhauled 57% suffered from excessive engine wear alone, and 20% had both high wear and heavy deposits.

Three special tests were carried out on a Lauson engine, and most of the engine wear occurring was due to friction and abrasion.

It is suggested that a reduction in frictional wear in engines would solve many engine wear problems. J. W. H.

165. How to evaluate lube oil additives. M. A. Hughes and E. C. Hughes. *Petrol. Process.*, 1952, **7**, 1274–8.—Of forty-seven lube oil additives tested, the details are presented in tabular form of the ten best as being worth engine testing. All but one of these is characterized by having sulphur, phosphorus, and an alkaline metal.

Conclusive evidence is given to show that sulphur is the most important element in these additives, but that its result depends on a proper balance of the metal.

A 50% saving on inhibitor cost is thought possible by the use of the best of the additives considered. J. W. H.

166. How the lube oil test unit works. Anon. *Petrol. Process.*, 1952, **7**, 1279.—The Polyveriform lube oil unit used for the lube oil oxidn test (*see* Abs. 165) can handle twelve such tests at one time.

A piece of weighed bearing metal is placed in 100 g of oil sample kept at 325° F, and after the run, consisting of a thrust load and rotation under oxidn conditions, tests are carried out on the oil sample, and the metal is re-weighed to determine the degree of corrosion. J. W. H.

167. Behaviour of lubricating oil in internal combustion engines. H. Kern. *Erdöl u. Kohle*, 1952, **5**, 564–9.—Following a general outline of the principal causes of oil ageing in I.C. engines, the particular effect of blow-by on oil deterioration is discussed and means for minimizing this (*e.g.*, improved crank-case ventilation) are described. Data quoted and diagrams given are mainly taken from U.S. literature. V. B.

168. Selection and lubrication of roller chain drives. P. Pietsch. *Erdöl u. Kohle*, 1952, **5**, 643–5.—Factors governing choice of chain drives are outlined and types of drive illustrated. Formula for calculating link surface is given. For chains in housings a thin oil of high wettability is preferred, whilst for exposed chains grease lubrication is recommended. V. B.

169. Modern machine-tool lubrication practice. W. D. Whalen. *Mech. Engng, N.Y.*, Oct. 1952, **74** (10), 803.—Lubrication systems of numerous machine tools are described and illustrated, and manufacturers' recommendations for suitable oils given. Lubrication problems associated with high speed planers are discussed, and it is stated that laminated phenolic–plastic inlays for the tableways have proved satisfactory. T. T.

170. Patents. U.S.P. 2,591,586 (30.9.50; 1.4.52). A. H. Morway and A. H. Matuszak, assrs to Standard Oil Development Co. High temp grease is prepared by adding 1 to 4 molar proportions of acrolein, acrolein dimer, or mixtures thereof to a quantity of lub oil, thereafter mixing in a 2·5 to 5% aqueous metal hydroxide solution, adding from 1 to 4 molar proportions of a C_{12} to C_{22} fatty acid and adding metallic hydroxide solution to ensure saponification of the acid, heating the mixture, and finally adding a further quantity of lub oil equal to the starting quantity.

U.S.P. 2,592,624 (28.9.46; 15.4.52). F. Veatch and J. G. Partch, assrs to Standard Oil Co. Cutting oil concentrate obtained by reacting "motor polymer" and sulphur monochloride at below 50° C and in presence of a paraffin oil diluent and an anhydrous alkaline base.

U.S.P. 2,593,496 (4.2.48; 22.4.52). H. G. Smith and T. L. Cantrell, assrs to Gulf Oil Corpn. Additives for lub oil.

U.S.P. 2,594,286 (8.8.48; 29.4.52). W. C. Bryant and H. Frost, assrs to Swan-Finch Oil Corpn. Grease composition comprising a petroleum lubricant and a substituted diamide gelation agent of specified constitution.

U.S.P. 2,594,795 (20.10.49; 29.4.52). L. L. Neff, assr to Union Oil Co. Lub oil containing 0·2 to 15%, by wt, of a condensation product of a hydrocarbon-substituted phenol and acetylene.

U.S.P. 2,594,822 (16.4.49; 29.4.52). F. H. Stross, S. T. Abrams, and R. J. Moore, assrs to Shell Development Co. Preparing greases by dispersing a polyvalent metal alcoholate in a lub oil, hydrolysing, and removing non-metallic hydrolysis products.

U.S.P. 2,595,140 (1.12.50; 29.4.52). R. L. Heinrich, assr to Standard Oil Development Co. Oxidn resistant lub oil comprising a polymer of an α-olefin of 5 to 10 C atoms and at least 0·1%, by wt, of carbazole.

U.S.P. 2,595,161 (24.5.50; 29.4.52). A. J. Morway and D. W. Young, assrs to Standard Oil Development Co. Lub grease comprising a lub oil, a metal soap of a fatty acid and a small amount of bis (5-methyl-2-hydroxy phenyl) sulphide.

U.S.P. 2,595,160 (25.1.46; 29.4.52). H. W. Rudel and J. I. Wason, assrs to Standard Oil Development Co. Lub oil for steam turbines comprising lub oil plus 0·01 to 0·5%, by wt, of thioether substituted tetrahydrophthalic and hexa-hydrophthalic acids, anhydrides, or monoesters.

U.S.P. 2,595,170 (14.11.49; 29.4.52). H. W. Rudel and A. D. Kirshenbaum, assrs to Standard Oil Development Co. Stabilized lub oil containing, as oxidn inhibitor, a product obtained by reacting a double-bonded non-aromatic, non-acetylenic hydrocarbon having at least 3 C atoms with sulphur chloride or bromide. R. C. R.

U.S.P. 2,599,337 (26.3.48; 3.6.52). E. Liebler and E. P. Cashman, assrs to Standard Oil Development Co. Additives for improving the pour point of lub oils are made by reacting a chlorowax–naphthalene condensation product with a benzene sulphonyl halide in presence of a Friedel–Crafts catalyst.

U.S.P. 2,599,343 (8.2.50; 3.6.52). A. J. Morway and J. J. Kolfenbach, assrs to Standard Oil Development Co. Lubricating greases are prepared by mixing a fatty acid with a mineral lubricating oil, adding a metal base in excess to saponify the acid, adding an aldehyde capable of undergoing the Cannizzaro reaction in presence of said base, heating to 210° to 340° F with mixing to remove water and any alcohol produced, and further cooking and blending in additional lubricating oil to form the desired grease.

U.S.P. 2,599,350 (17.9.49; 3.6.52). H. W. Rudel and J. M. Boyle, assrs to Standard Oil Development Co. An oxidn inhibitor is made by reacting a double-bonded non-aromatic hydrocarbon with a sulphur halide and reacting the product with an alkali metal dithiocarbamate at 50° to 150° C.

U.S.P. 2,599,353 (21.6.50; 3.6.52). J. C. Showalter, assr to Standard Oil Development Co. A stainless emulsible grease comprising a mineral lub oil, alkali metal petroleum sulphonates, tall oil, a polyhydric alcohol, an oil-soluble corrosion inhibitor, a fatty acid, and talc or mica.

U.S.P. 2,599,553 (17.2.50; 10.6.52). B. W. Hotten, assr to California Research Corpn. Complex aluminium soap having at least two dissimilar organo anions, one being derived from an organic acid the aluminium di-soap of which has a white oil solubility of $\leq 5\%$ at 400° F and the other from an organic acid the aluminium di-soap of which has a white oil solubility of $<1\%$ at 400° F.

U.S.P. 2,599,683 (3.5.49; 10.6.52). S. T. Abrams and F. H. Stross, assrs to Shell Development Co. A grease comprising a lub oil, 5 to 40 wt % of an anhydrous inorganic gel of an amphoteric metal and 2 to 20 wt % of the gel of a lipophilic acid containing at least one hydrocarbon radical having ≤ 10 carbon atoms, said acid being a phosphinic or phosphonic acid, a fatty or aminofatty acid, an aliphatic dicarboxylic acid, sulphonic acid, or naphthenic acid.

U.S.P. 2,599,736 (27.8.48; 10.6.52). D. E. Adelson and R. G. Larsen, assrs to Shell Development Co. Wear and oxidation inhibitors for lub oils are reaction products formed by heating a biuret and an aliphatic ester of a hydroxyacid in a mol ratio between 1 : 1 and 6 : 1 at 100° to 250° C for 30 to 100 hr.

U.S.P. 2,599,761 (21.2.49; 10.6.52). D. Harman and R. E. Thorpe, assrs to Shell Development Co. Tributyl phosphite and dibutyl trichloromethanephosphonate are reacted in equimolecular proportions at 100° to 200° C to yield an e.p. additive.

U.S.P. 2,599,794 (U.K. 28.10.47; 10.6.52). W. C. Webber, assr to Shell Development Co. E.P. additives are 6-nitro-1 : 3-benzodioxanes containing one or two trichloromethyl radicals directly attached to the dioxane ring.

U.S.P. 2,599,803 (1.11.48; 10.6.52). S. A. Ballard, R. C. Morris, and J. L. Van Winkle, assrs to Shell Development Co. Lubricating composition comprising a liquid saturated aliphatic acid diester of a polyalkylene glycol and 1 to 10% of a polymer of an ester of acrylic or methacrylic acid.

U.S.P. 2,599,917 (25.1.50; 10.6.52). M. C. Hommel, assr to Dow Corning Corpn. Lubricant composed of a halogenated arylpolysiloxane fluid, 2 to 10 wt % chlorinated diphenyl or chloronaphthaxanthate and 0 to 2 wt % benzyl disulphide or 2-benzylthiacyl-N : N-diethylthiocarbamyl sulphide.

U.S.P. 2,599,984 (U.K. 7.2.49; 10.6.52). H. J. Fletcher and M. J. Hunter, assrs to Dow Corning Corpn. Lubricant comprising a liquid copolymeric siloxane containing halogenated phenyl or xenyl radicals, the remaining organic radicals being methyl or phenyl radicals.

U.S.P. 2,600,058 (9.3.49; 10.6.52). E. C. Knowles, O. P. Puryear, and G. W. Eskert, assrs to The Texas Co. Lubricating grease comprises an oleagineous base and 5 to 45 wt % of a metal soap of a phosphated hydroxy fatty acid.

U.S.P. 2,600,079 (26.9.49; 10.6.52). S. M. Scully, assr to O. & S. Bearing Co. Hardened self-lubricating radial and thrust bearing.

U.S.P. 2,600,154 (1.5.50; 10.6.52). W. H. Brugmann, assr to Standard Oil Development Co. Antioxidants for petroleum hydrocarbons are obtained by heating 2 mol of a phenol with 1 mol phosphorus sulphochloride at 100° to 160° C and reacting the product with an alkali or alkaline earth metal salt of a diester of a thiophosphoric acid.

U.S.P. 2,600,321 (29.12.49; 10.6.52). J. J. Ryle, assr to General Electric Co. Self-lubricating plastics are made by moulding a powdered mixture of a resinous moulding material, an inert filler, and molybdenum sulphide.

U.S.P. 2,600,798 (29.9.49; 17.6.52). F. P. Otto and O. M. Reiff, assrs to Socony-Vacuum Oil Co. Inc. V.I. improvers for lub oils are made by reacting maleic anhydride, styrene, and thiophene or an alkyl-substituted thiophene at 75° to 125° C and esterifying the product with a normal primary saturated alcohol of 10 to 18 carbon atoms. J. M. S.

Ger.P. 844,035, 21.5.52. C. M. van Battum, assr to N.V. Bataafsche Petroleum Mij. Method for production of lub oils by alkylation of aromatic extracts from light petroleum with a mixture of olefins obtained by cracking high-mol paraffin hydrocarbons.

BrennstChemie, 1952, **33** (11–12). R. T.

Bitumen, Asphalt, and Tar

171. Revision of DIN 1995 : cut-back bitumen. U 35 Fractional analysis of cut-back bitumen. Anon. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (8), 212–13.—The committee Bitumen and Cut-back Bitumen of the active group Asphalt and Tar Roads of the Research Society for road affairs, following the revision of DIN 1995—testing methods U 35 and U 37—proposes the new apparatus reproduced with standard dimensions. Determinations described are : fractional analysis of cut-back bitumen, loss in wt on storage, adhesion, soft. pt., and point of refraction of the dist residue.
R. T.

172. Testing viscosity of bitumen emulsions. H. Raudenbusch. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (6), 137–40.—In view of forthcoming new issues of DIN 1995, Pt II (testing methods for bitumen binders) visc of emulsions is considered. The literature is reviewed, and standard viscometers and their use in various countries are discussed. Tests were carried out to determine the eff of the Engler viscometer up to 15° E, the advantage of other instruments over the Engler, the possible influence of structure-visc, thixotropy, etc., the validity of a conversion factor from one scale to another and the relation of the determined factor to the recognized conversion factor. The tests were carried out with the Engler, the Saybolt-Furol, and STV (3 mm) 50 cm^3 efflux, (4 mm) 50 cm^3 efflux, and (4 mm) 100 cm^3 efflux. The measurements in the Engler and SF-viscometer were carried out according to the relevant specifications. In addition to the bitumen emulsions, measurements were made on mineral oils of a similar range. Measurements should show whether the results obtained with the separate instruments bear a similar ratio with oils and emulsions. Results are tabulated and conclusions drawn from them. R. T.

173. Colloidal nature of bitumen. Anon. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (7), 176–9.—(*See* Abs. 1172—1952.)

174. Separating bitumen into its chemical constituents. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (7), 183–5. (*Abs. from Anal. Chem.* 1951, **23** (6), *by G. O'Donnell.*)—(*See* Abs. 521—1952.) R. T.

175. Bitumen-road tar blends and their analysis. E. Flister. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (7), 180–2.—The purpose of adding bitumen to road tar, addition limits, and the production of homogenous mixtures with standard materials are discussed. Analyses by four variations of the sulphonation process of standard tar–bitumen mixtures to DIN 1995 are discussed and the results tabulated with the % difference from the actual bitumen cont. R. T.

176. Studies of tar–bitumen mixtures. Von Skopnik. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (6), 143–7.—A review is presented of observations on tar–bitumen mixtures in practice and research with reasons for the mixing. Tar–bitumens are used widely with good results in surface treatments and for mixed chip preparation. Small bitumen additions increase the strength of the tar. Both bitumen and tar vary widely in properties according to their origin, and satisfactory results depend on their correct evaluation. Asphaltic bitumen is valuable for roads, paraffinic bitumen unsuitable. The chief fault in mixtures is segregation of the high-mol aromatic constituents of the tar. Conventional analytical testing methods are inaccurate and complicated, so that in case of dispute, tar and bitumen cannot be separated. It is impossible, therefore, to determine whether the fault lies in the tar, the bitumen, the method of production, or unsuitable stone. Useful evidence is provided by the microscope, sulphuric acid test, and the impact test with a special hammer. When specified tar is used, bitumen and tar are miscible without segregation and are stable in storage. R. T.

177. Roofing compositions and similar materials. Classification, properties, standards, characteristics. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (6), 149–51.—The chief groups of roofing compositions embodying a smooth pattern of bitumen on

a carrier, mostly cardboard, wool felt, other textiles, or metal, are classified according to their sp applications. Properties are discussed and relevant D.R.P. are listed. R. T.

178. Construction of multilayer bitumen composition roofs in the U.S.A. W. Schütze. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (8), 193–8.—Materials used in combustible and incombustible, light and massive roof construction are discussed. Roof life is guaranteed according to construction, No. and thickness of paperboards and bitumen coatings, and surface seal design. Roof slope is important. German and American practice and relevant specifications are compared. Drawings with explanatory legends represent structural types. Twelve references. R. T.

179. Discussion of practical sealing examples on flat roofs. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (8), 199–205 (*Ann. Tech. Inst. of buildings & public works ;* **51**, *March* 1952, *lecture by M. Varlan.*)—Amenities have popularized flat roofs, which date back 5000 years. Construction and sealing methods have become a science. Sealing procedure is compared with that of 1925, and the importance of bitumen soft. pt. is recognized. French, American, and British methods are compared relative to national economical situations. Drawings with explanatory legends typify constructions. R. T.

180. Studies on the improvement of the wettability of bituminous road building binders on moist stone. Anon. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (6), 148–9.—Wettability of moist stone with bitumen is improved by surface active agents added to the binder or stone. Owing to its phenol cont, tar has affinity for water and bitumen. Additions of phenol 10%, metal soaps, Cu_2Cl_2, and hydrochloramine gave good results. The English Road Research Institute obtained better results with a solution of tar oil and cetylpyridine bromide. In India Turkey-red oil is used. Laboratory experiments were carried out with Turkey-red oil and $Ca(OH)_2$ separately and with mixtures of Turkey-red oil and $Ca(OH)_2$ in varying proportions on 1 kg stone added to 40 g warm cut-back bitumen. The best results for wettability were obtained with 1·5% $Ca(OH)_2$ + 0·6% Turkey-red oil and 2·0% $Ca(OH)_2$ + 0·5% Turkey-red oil + 1 kg stone added to 40 g warm cut-back bitumen. The theory of the process is discussed. R. T.

181. Application of brown coal tar products in the roofing composition industry and in road construction. Pt II. Anon. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (8), 214–16.—(*See* Abs. 582—1952.)—Use of brown-coal tar products for roofing compositions is discussed. Tenacity and bursting tests on multilayers of roofing paper steeped in : brown-coal tar from low-temp carbonization, brown-coal generator tar, brown-coal generator tar with 25% montan wax pitch, and the residue after dist of 30% from brown-coal generator tar are reported. Tests were carried out for comparison using coal tar oil, prepared coal tar, coal tar soft pitch, and Mexico bitumen. Tabulated results show that brown-coal tars from low-temp carbonization are unsuitable for steeping roofing paper. Brown-coal generator tar is suitable only after dist off 25 to 30% or adding brown-coal tar pitch to adjust its consistency. For special tar roofing paper production hard brown-coal tar distillate and cleavage pitch are suitable when stabilized with sufficient stone dust. For road construction adhesive power of prepared brown-coal tars is improved by adding acid resins or bitumen. Extract road tars are obtained from raw brown-coals by means of high-boiling brown-coal tar oils, the inorg and insol swelled portions of the coal act as fillers. Condensed road tars are produced by polymerization of unsaturated compounds of brown-coal tar and oils or condensation of reactive phenols—without separation from the brown-coal tar oils—with suitable partners (aldehydes, ketones, amines). These tars can be produced for use as hot or cut-back bitumen or emulsions. Unfavourable properties are discussed. R. T.

182. Production and use of brown coal tar and brown coal tar oils. H. Munderloh. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (6), 157–8.—From 1910 to 1944 the output from low-temp carbonization in Germany rose from 75,000 tons tar and 400,000 tons coke to *ca* 2 million tons tar and oils. A schematic representation of the material

balance from raw coal to carbonization products is presented. In the East and West zones both Lurgi-purge-gas and Geissen low-temp carbonization plants are operated. The characteristic analytical data for the coal tar are $d_{50} = 0{\cdot}950$; $V_{50} = 4°$ E; creosote = 15 to 20%; pour point = 40° C; coke = 10%; cal. val. = 9200 g. cal; benzene insol = 0·5%. Processing of the tar and products with their analytical data and uses are discussed. For details of the use of the tar residues in road construction and roofing compositions see above (Journal, 1951, **2** (9), 239; 1952, **3** (1), 25; 1952, **3**, 76). R. T.

183. Use of coal tar resins as bases in coloured paint technique. K. H. Prestle. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (8), 205–7.—Decomp of coal tar pitch and coal tar into five groups by Mallison, Dickinson, and Duriez with selective solvents and by the author into three groups, low, medium, and high coal tar resins is discussed and illustrated. The low group is very plastic and receptive of colour, the medium less plastic but weather-stable, the highest brittle and suitable only for sp applications, *e.g.*, core binders. The lowest group mixed with coal tar heavy oils is a good wood preservative. Good covering power is obtained by combining with synthetic resins. For rust prevention bituminous coatings combine eff with cheapness. They are very stable under water. Other applications, including coloured coatings, are discussed. R. T.

184. Plasticizing coal tar pitches (plastix) by addition of rubber. K. H. Prestle. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (7), 182.—A process is quoted which is claimed to be cheaper than that given in U.S.P. 1,884,240 (See above Journal 1952, **3** (3), 60–1). R. T.

185. Patents. U.S.P. 2,592,564 (22.5.48; 15.4.52). H. F. Hardman, assr to Standard Oil Co. Asphalt cutback having improved adherence to wet stone and comprising cutback and a phosphoric acid ester having an acid hydrogen atom in the phosphoric acid radical.

U.S.P. 2,594,352 (27.8.49; 29.4.52). A. Schmalenbach, assr to Koppers Co. Process for the continuous distillation of tar. R. C. R.

U.S.P. 2,599,264 (26.1.48; 3.6.52). H. W. Lawson, assr to Alpine Corpn. Flooring composition consisting of asbestos fibres, pigment, and a resinous binder made by air-blowing a petroleum residue having a pour point of 30° to 80° F and an iodine no. of 180 to 240.

U.S.P. 2,599,986 (Netherlands 7.1.44; 10.6.52). J. Goebel, P. Bakker, and J. G. Hoogland, assrs to Shell Development Co. Blown bitumen and polystyrene are heated together for 1 hr at 300° C. The product is suitable for use as a scratch resistant surface coating. J. M. S.

Special Hydrocarbon Products

186. Fluids for hydraulic power transmission. A. E. Bingham. *Fluid Handl.*, Aug. 1952 (31), 239–43.—The desirable properties of hydraulic fluids based on petroleum, castor oil, water–glycol, halogenated, and synthetic compounds are summarized for aircraft, marine, and land use.

Techniques for flushing systems are given to enable fluids to be changed. D. H.

187. Patents. U.S.P. 2,598,666 (30.6.48; 3.6.52). L. M. Sesso and A. M. Jordan, assrs to S. C. Johnson & Son, Inc. Aqueous wax composition consisting of 3 to 14 wt % of paraffin, ouricury, carnauba, or beeswax, 3 to 30 wt % of an alkanol having 1 to 4 carbon atoms, acetone, dioxane, or the monomethyl, monoethyl, or diethyl ether of ethylene glycol, an emulsifying agent and water.

U.S.P. 2,598,989 (24.3.50; 3.6.52). L. D. Goodhue and W. M. Florence, assrs to Phillips Petroleum Co. Fungicidal compositions in which the active ingredient is *N* : *N*-dimethyl- or *N* : *N*-diethyl- or piperidine-*S*-*tert*-butylthiosulphenyl dithiocarbamate.

U.S.P. 2,599,130 (19.9.49; 3.6.52). G. G. Rumberger and A. M. Heald, assrs to Marathon Corpn. Wax which is non-reactive with urea is used in the preparation of laminated sheet material.

U.S.P. 2,599,339 (8.12.49; 3.6.52). S. B. Lippincott and D. W. Young, assrs to Standard Oil Development Co. Paraffin wax is mixed with a minor amount of an alkene–maleic anhydride copolymer completely esterified with a monohydric saturated aliphatic alcohol.

U.S.P. 2,599,373 (11.1.49; 3.6.52). R. H. Chrzanowski, assr to Osmose Wood Preserving Co. Thixotropic composition for preserving wood consisting of a liquid hydrocarbon, a fatty acid or a salt thereof, a water-soluble mycocide wood preservative, and a solid inert filler.

U.S.P. 2,599,762 (17.9.45; 10.6.52). C. W. Kleiderer, assr to U.S.A. as represented by the Secretary of the Navy. Potting composition consisting of paraffin having m.p. of 123° to 140° F, solid hydrogenated castor oil, ethyl cellulose having an ethoxyl content of 46·8 to 48·5%, and hydroquinone monobenzyl ether.

U.S.P. 2,599,810 (13.11.50; 10.6.52). W. A. Chenicek and W. K. T. Gleim, assrs to Universal Oil Products Co. Crops are stabilized against oxidative deterioration by means of a 5-hydroxycoumaran substituted in the 6-position by a branched chain alkyl group.

U.S.P. 2,599,827 (1.5.50; 10.6.52). T. R. Hansberry, assr to Shell Development Co. Growing plants are defoliated by means of a composition comprising a solution of pentachlorophenol and an oil-soluble emulsifier in a mineral spray oil.

U.S.P. 2,600,045 (26.8.50; 10.6.52). R. Blondeau, J. Van Overbeek, and R. R. Whetstone, assrs to Shell Development Co. Herbicidal composition comprising a hydrocarbon oil having at least a 10% aromatic content and a hydrocarbon substituted phenol, the hydrocarbon substituent having 8 or 9 carbon atoms.

U.S.P. 2,600,126 (7.5.47; 10.6.52). K. G. Nolan and J. H. Fletcher, assrs to American Cyanamid Co. Fungicidal compositions comprise a carrier dust and halogenated or nitrohalogenated thiophenes.

U.S.P. 2,600,378 (14.4.50; 17.6.52). J. B. Dickey and H. W. Coover, assrs to Eastman Kodak Co. Insecticidal compounds are made by heating at 140° to 205° C a trialkyl phosphate with acetic anhydride in presence of a catalyst which is boron trifluoride etherate, sulphuric or boric acid, boric anhydride, or butyl borate.

U.S.P. 2,600,431 (17.6.50; 17.6.52). L. Rosenstein and M. H. Gorin. Solid complexes of thiourea and chloropicrin are pesticides.

U.S.P. 2,600,436 (31.8.48; 17.6.52). J. M. Shaw, T. R. Bartley, and R. S. Rosenfels, assrs to U.S.A. as represented by the Secretary of the Interior. Method of killing submerged water-weeds which comprises injecting into the water a mixture of a volatile herbicide hydrocarbon boiling between 250° and 400° F and a surface active dispersing agent.

U.S.P. 2,600,461 (17.3.49; 17.6.52). C. F. Backus. Coating composition having good adhesive and drying properties comprises 100 parts milled polychloro-2-butadiene-1 : 3 dissolved in 250 to 400 parts hydrocarbon solvent, 1 to 10 parts wood rosin derivative, phenol–formaldehyde resin or coumarone–indene resin, and 30 to 70 parts filler, of which at least 40% is fibres.

U.S.P. 2,600,668 (12.6.47; 17.6.52). L. C. McAlister, assr to National Distillers Products Corpn. Insecticidal composition composed of an aqueous suspension of pyrethrins, 1 : 1 : 1-trichloro-2 : 2-bis (*p*-chlorophenyl) ethane and the mono-*n*-butyl ether of diethyleneglycol derivative of chloromethyldihydrosafrol.

U.S.P. 2,601,109 (17.4.48; 17.6.52). J. J. Fish, assr to Sun Chemical Corpn. Blends of olefin polymers and petroleum waxes are made by subjecting a mixture of the polymer and wax to treatment with boron trifluoride or a halide of aluminium, iron, or zinc at a temp above 200° F but below the temp at which wax cracks. J. M. S.

Derived Chemical Products

188. Patents. U.S.P. 2,599,432 (13.11.48; 3.6.52). P. D. Caesar, assr to Socony-Vacuum Oil Co. Inc. 2 : 3 : 4 : 5-tetrachlorothiolane.

U.S.P. 2,599,737 (8.7.49; 10.6.52). D. E. Adelson, assr to Shell Development Co. Esters are produced by reacting a compound of the formula $NH_2C(=X)-NH-C(=Y)NH_2$ with an alcohol. In the formula X is oxygen or sulphur and Y is oxygen, sulphur, or an imino group.

U.S.P. 2,600,287 (31.12.48; 10.6.52). J. E. Wicklatz, assr to Phillips Petroleum Co. *p*-Toluidine 2-chlorethane sulphonate is prepared by mixing an aqueous alkali metal bisulphite with vinyl chloride, treating with free oxygen at 25° to 75° C for 5 to 50 hr, recovering the alkali metal 2-chlorethane sulphonate, mixing this with *p*-toluidine, introducing hydrochloric acid, and maintaining the temp at 80° to 100° C until reaction is complete.

U.S.P. 2,600,415 (26.12.49; 17.6.52). L. A. Mikeska, assr to Standard Oil Development Co. Water soluble *tert*-alkenyl sulphonates are made by dissolving propylene polymers boiling in the range 220° to 320° C in a hydrocarbon solvent, mixing the solution with chlorsulphonic acid and a dialkyl ether and maintaining at −10° to +50° C, neutralizing the product with aqueous sodium hydroxide, separating the alkenyl sulphonates by extraction with aqueous alcohol, washing the extract with a naphtha, and finally distilling off the water and alcohol.

U.S.P. 2,600,571 (14.10.47; 17.6.52). W. W. Prichard, assr to E.I. du Pont de Nemours & Co. Butadiene–cobalt carbonyl hydride adduct.

U.S.P. 2,600,737 (3.11.47; 17.6.52). W. W. Crouch and R. T. Werkman, assrs to Phillips Petroleum Co. Tertiary alkyl trithiocarbonates are made by forming a solution of a tertiary alkyl mercaptan and carbon disulphide in a low boiling dialkyl ether, adding slowly a conc aqueous alkali metal hydroxide solution and maintaining at 25° to 65° C until pptn of the product is complete.

U.S.P. 2,600,766 (14.1.49; 17.6.52). G. W. Hearne and C. G. Schwarzer, assrs to Shell Development Co. Vicinal ketones are made by hydrolysis of a 1 : 2-dihaloaldehyde to the corresponding 1 : 2-dihydroxyaldehyde, acidifying the hydrolysis mixture to a pH below 5 and maintaining it above 50° C for at least ½ hr while distilling off the water.

U.S.P. 2,600,838 (26.11.47; 17.6.52). J. W. Brooks, assr to Socony-Vacuum Oil Co. Inc. Thienyl mercaptals and mercaptols.

U.S.P. 2,601,014 (17.8.49; 17.6.52). J. K. Wolfe, assr to General Electric Co. Fluorinated chlorocarbon compounds are made by electrolysing a chlorohydrocarbon in anhydrous liquid HF.

U.S.P. 2,601,063 (24.9.48; 17.6.52). P. V. Smith, L. A. Mikeska, and A. H. Popkin, assrs to Standard Oil Development Co. Glycol esters of alkyl mercaptocarboxylic acids.

U.S.P. 2,601,322 (3.7.48; 24.6.52). R. R. Reese, assr to Jefferson Chemical Co. Inc. Olefin dichlorides are prepared by reacting an olefin and chlorine in a liquid mass of the olefin dichloride containing iron oxide. The iron oxide prevents substitution reactions.

U.S.P. 2,601,520 (24.6.49; 24.6.52). D. Harman and A. R. Stiles, assrs to Shell Development Co. Dialkenyl alkanephosphonates and polymers thereof.

U.S.P. 2,601,659 (2.1.51; 24.6.52). G. W. Hearne and D. S. La France, assrs to Shell Development Co. 1-Alkylidene-2-hydroxypropionitriles are made by hydrolysing the corresponding 2-halo compounds in an aqueous medium in presence of a basic agent at 30° to 100° C. J. M. S.

Coal, Shale, and Peat

189. Infra-red spectra of coals. R. R. Gordon, W. N. Adams, and G. I. Jenkins. *Nature, Lond.*, 1952, **170**, 317.—By grinding coal with "Nujol" (25% wt/vol) in an agate mortar for 18 hr a suspension in which 80% of the particles were less than 1μ size was obtained. Infra-red spectra were obtained in the range 750 to 1300 cm^{-1} of suspensions of bituminous, coking, and anthracite coals. The first two gave similar spectra, but that of anthracite was considerably different, and resembled that of pitch. H. C. E.

190. Nature of the solution obtained by pyridine extraction of coal. E. Boult, H. R. Thirsk, and H. E. Blayden. *Nature, Lond.*, 1952, **170**, 317.—Diluted pyridine extracts obtained from coal were evaporated on glass slides, and the deposits were transferred to a collodion base. Electron micrographs of this material disclosed a varnish-like deposit, with no evidence of any discrete particles. This observation is in agreement with the molecular weights of 500 to 1400 previously reported, and is in disagreement with the belief that pyridine extracts are essentially colloidal dispersions. H. C. E.

191. Glance into the colloidal system of coal tar. H. Mallison. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (7), 175–6.—(*See* Abs. 2761—1952.)

192. Conversion and utilization possibilities of hydrocarbons from low-temperature coal tar. W. Fuchs and K. A. Hamacher. *Erdöl u. Kohle*, 1952, **5**, 561–3.—Tests were carried out on a neutral oil fraction, rich in *cyclo*-olefines; this can be easily dehydrogenated, as shown by experiments with S at 140° to 160° C. Catalytic (metals of periodic group 6) conversion of the oil was also investigated. Tabulated results indicate considerable variation according to cat used, but appreciable aromatization could be obtained. Aromatic content could also be increased by air blowing at 140° to 150° C, in absence of cat. Apart from such processing, new uses for neutral oil fraction, as such, are suggested (*e.g.*, plasticizer, rubber solvent, dye solvent). Proposed method for separation of oil into various hydrocarbon groups using acid, selectivs solvents, and urea is also outlined. V. B.

193. Shale oil extraction techniques. J. Grindrod. *Petrol. Times*, 14.11.52, **56**, 963.—A review is given of techniques suitable for specific types of oil shale. A table compares oil shales of various origins. The Swedish system, which includes the Ljungström process, is described, and a flow sheet provided. G. A. C.

194. Oil production from oil shales. H. A. Beyer. *Erdöl u. Kohle*, 1952, **5**, 630–2.—Review. Shale oil reserves are estimated at 5×10^{11} brl. Brief notes are given concerning the following shale-processing retort types: Pumpherston; Hayes; U.S. Bureau of Mines NTU; Union Oil Co.; Gas-combustion; Royster; Fluid oil-shale; Gasflow. Last named, introduced into the U.S.A. in 1948, had been anticipated by a similar cross-sectional flow process operated in Germany (Württemberg) since 1941. Flow diagram is given. V. B.

195. Highly refined waxes derived from brown coal with especial consideration of their properties and application possibilities. G. Rosenberg. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (7), 169–74.—A brief sketch of the earlier uses of wax, chiefly beeswax, and the increasing demand for waxes. Crude Montan wax obtained from brown coal quickly entered the wax processing industry owing to its hardness and lustre. Faults are dark colour and, compared with Carnauba wax, low oil absorption and oil-binding property. Waxes developed by oxidn of the wax acids with chromic acid are discussed at length and data tabulated. Technical application requirements of the most important products obtained are discussed and the waxes named compared with corresponding natural products. Refined products from crude Montan wax compare favourably in practical applications with the best natural waxes, and surpass them in many important properties. R. T.

196. Patent. U.S.P. 2,601,257 (10.11.49; 24.6.52). F. E. Buchan, assr to the U.S.A. as represented by the Secretary of the Interior. Continuous process for the thermal extraction of oil from oil shale. J. M. S.

Miscellaneous Products

197. Plasticizers for polyvinyl chloride. H. Jones and A. Hill. *J. Oil Col. Chem. Ass.*, 1952, **35**, 485.—The effect of the chemical structure of plasticizers on their solubility relationships with PVC type polymers is discussed. Gelling tests were carried out and results are presented in tabular form for nine polymers and some sixty liquids. The "effectivity quantity" is used to compare plasticizers. It is the amount of a plasticizer which needs to be used with PVC to give a compound having specifically defined properties. The results of such determinations are listed. It has been found that generally plasticizers are effective relatively to their vises. Observations were also made on the effect of a change of temperature on PVC plasticizer systems. The stability on ageing of PVC plasticizer compounds is considered with reference to the elimination of plasticizer. Plasticizer can be lost by evaporation solvent extraction or migration. The concept of the ideal plasticizer is elaborated. D. K.

198. Synthetic detergents up to date. II. J. W. McCutcheon. *Soap, N.Y.*, Aug. 1952, **28** (8), 52.—Pt II of a series listing synthetic detergents by trade name. Manufacturer, chemical composition and % concn, main uses, and physical form are given. M. V. J.

199. Milled detergent bar. C. F. Jelinek, R. L. Mayhew, and J. A. Yeager. *Soap, N.Y.*, Aug. 1952, **28** (8), 42.—An account is given of the development of an all purpose bar for military usage. The bar was to be suitable for use in soft, hard, and sea waters and to be made of non-strategic materials.

Various compositions based on alkyl benzene sulphonates were tested for lathering and subsequently for laundry, dishwashing, and shaving. Consideration was also given to physical form and storage stability. The composition of the bar finally chosen was as follows: 47% Tallow soap (88% soap, 12% H_2O); 20% Sorapon SF concn (Approx 85% active); 20% Nekal A (Approx 55% active); 10% Aerosol AY (Approx 100% active); 2% Carboxymethyl cellulose; 1% Perfume. M. V. J.

200. Foaming and wetting agents. H. Mosurski. *Bull. Main Petrol. Inst.*, 1951, **6**, 1, 21–2 (*Supp to Nafta*, 1951, **7**).—Comparison between "Arylaine" (alkylaryl sulphonate of sodium), "Mersolat" (straight chain sulphonate of sodium), and fatty soap shows their different frothing and wetting properties. M. S.

201. CMC—an aid to washability. Pt II. J. G. Jarrell and H. B. Trost. *Soap, N.Y.*, Aug. 1952, **28** (8), 50.—The paper continues the account of CMC as a fabric size. Medium viscosity CMC was found to compare favourably with starch as a stiffener, to impart a good finish, and to make the fabric easy to iron. The author reports that The American Institute of Laundering found that an add-on of 0·075% CMC made possible drastic reductions in quantities of soap and bleach used and some reduction in washing time. Tensile strength loss was also reduced. Commercial laundries have found CMC useful for finishing sports shirts. Details are given of the procedure used in evaluating the soil resistance and washability properties of CMC. M. V. J.

202. Wax remover evaluation. M. M. Maglio and F. J. Pollnow, Jr. *Soap, N.Y.*, Aug. 1952, **28** (8), 149.—The article describes the development of a method for comparing the efficiencies of wax removers. The gloss of waxed black inlaid linoleum panels was measured before and after mechanical scrubbing with test solutions and the results analysed statistically. A 5% potassium oleate soap solution containing 1 ml of 28% NH_3 per litre was used as a standard. Results are given for two wax removers: (*a*) an aqueous solution of a non-ionic detergent and a complex inorganic phosphate; (*b*) a modified amine detergent compounded with pine oil. The precautions necessary to obtain reasonable repeatability are discussed. M. V. J.

203. Cutting fluids for machine tools. C. M. Lanson. *Petrol. Engr*, Sept. 1952, **24** (10), C5–18.—The properties required in products for use as cutting fluids are surveyed with reference to the lubrication and cooling of the contact between tool and work. In addition, ingredients for film-forming, anti-rusting, and anti-corrosion properties for different metals, operations, production rate, surface finish, and useful tool life are incorporated in modern types of cutting oils. E. K. J.

204. Reaction between styrene and drying oils. A critical survey of published papers. S. Kut. *J. Paint. Tech.*, July 1952, **17** (199), 295.—Pt V. Literature published in 1951 is reviewed. Hovey and Jerabek discussed catalysed styrenation. Falkenburg *et al* studied the degree of homogeneity of the products obtained by refluxing styrene with various drying and semi-drying oils in xylene. It is thought that many isomerized oils may be predominantly *cis–trans* isomers. The styrenation of tall oil acids varying in resin and fatty acid content was studied by Bosch and Drubel. Bergman and Browning studied the reaction of styrene and drying oils in the emulsion form. Brunner and Tucker give further details of the product obtained when tung oil and styrene are refluxed in xylol. Copolymer structures are suggested. D. K.

205. Mica as an antisettling agent in paints. H. W. Chatfield. *Paint Tech.*, July 1952, **17** (199), 289.—Factors affecting pigment settling and the properties of mica are discussed. It was observed, from experiments carried out with red lead, white lead reduced titanium dioxide as pigments, barytes as a filler, and various media, that the effect of mica on the settling rate depends on the type of pigment and composition of medium.

In all media tested, except that based on maleic anhydride rosin adduct, mica had a beneficial effect in reducing the settling rate of red lead. In paints containing barytes mica prevents the rapid formation of very resistant settled plugs. It has been observed that in certain cases mica accelerates the rate of settling. D. K.

206. Insecticide vaporizers. P. J. Spear. *Soap, N.Y.*, Aug. 1952, **28** (8), 147.—The article discusses in general terms the functions, performance, and safe operation of insecticide vaporizers. The importance of dependable and well situated thermostats in controlling rates of evaporation is stressed and an instance given of a vaporizer (designed to evolve 1 g insecticide/day) with a poorly placed thermostat which evolved ½ to 2½ g/day. Periodical checking and adjusting of the units is advised. The necessity for combining vaporizer control of flies with good sanitation such as elimination of breeding places is emphasized. Mention is made of the recommendations of the Interdepartmental Committee on Pest Control for safe operation. M. V. J.

207. Patents. U.S.P. 2,592,526 (12.11.48; 15.4.52). L. Seed, assr to I.C.I. Ltd. Forming solid ethylene polymers by polymerizing a composition comprising ethylene, water, and specified water-soluble ionic and non-ionic emulsifying agents at a temp between 50° and 400° C and at a pressure exceeding 200 atm.

U.S.P. 2,593,213 (26.10.48; 15.4.52). A. R. Stiles, assr to Shell Development Co. Preparing α-hydroxy phosphonates by reacting a dialkyl acid ester of phosphorus acid and a saturated aliphatic aldehyde at 0° to 200° C.

U.S.P. 2,593,676 (3.8.49; 22.4.52). E. R. Irwin, assr to Standard Oil Co. Slushing composition.

U.S.P. 2,594,278 (4.3.50; 29.4.52). L. L. Baumgartner, assr to The B.F. Goodrich Co. Herbicidal composition containing a chlorinated aryl ester of an aliphatic monocarboxylic acid and a mineral oil.

U.S.P. 2,594,322 (9.6.50; 29.4.52). N. J. Leonard, assr to Phillips Petroleum Co. Substituted oxy*cyclo*alkanes.

U.S.P. 2,594,341 (13.9.49; 29.4.52). J. J. Owen and E. V. Fasce, assrs to Standard Oil Development Co. Selective oxidation process for utilizing mixtures of oxygenated still bottoms.

U.S.P. 2,594,411 (11.2.49; 29.4.52). J. K. Fincke, assr to Monsanto Chemical Co. Preparing alkane sulphonic acids by oxidizing bis (alkylmercapto) methane with nitric acid.

U.S.P. 2,594,421 (26.2.48; 29.4.52). E. W. Gluesenkamp, assr to Monsanto Chemical Co. Detergent composition comprising oleic nitrile–ethylene oxide condensation product, starch, tetrasodium pyrophosphate, and carboxy methyl cellulose.

U.S.P. 2,594,431 (1.4.50; 29.4.52). J. C. Harris and M. Kosmin, assrs to Monsanto Chemical Co. Detergent composition comprising an abietic acid–ethylene oxide condensation product, a phosphate salt, and starch and/or carboxymethyl cellulose.

U.S.P. 2,594,452 (24.11.48; 29.4.52). M. Kosmin, assr to Monsanto Chemical Co. Preparing colourless alkylene oxide adducts by heating a melamine compound with an alkylene oxide in an alkaline medium having dispersed therein a substantially colourless boron compound.

U.S.P. 2,594,453 (1.4.50; 29.4.52). M. Kosmin and J. C. Harris, assrs to Monsanto Chemical Co. Detergent composition comprising a tall oil–ethylene oxide condensation product, a sodium phosphate, a non-phosphate salt, and carboxymethyl cellulose.

U.S.P. 2,594,537 (26.10.46; 29.4.52). H. S. Bloch and R. B. Thompson, assrs to Universal Oil Products Co. Resinous products from aromatic polyketones and polyamides.

U.S.P. 2,594,899 (8.9.49; 29.4.52). F. Fordemwalt, assr to American Cyanamid Co. Printing paste comprising a vat dye carried in a water-in-oil emulsion, the oil being a liquid hydrocarbon in which an alkyd resin is dissolved. R. C. R.

U.S.P. 2,598,854 (22.7.50; 3.6.52). F. A. Stoltz and E. J. Vaught, assrs to Pabco Products Inc. Metallic ornamental paint comprising bitumen or coal tar or stearine pitch, coumarone–indene resin, a volatile solvent, aluminium powder, and a filler, the major proportion of the filler being asbestos fibre.

U.S.P. 2,599,119 (18.8.50; 3.6.52). D. M. McQueen, assr to E.I. du Pont de Nemours & Co. Copolymers of ethylene and butene-1 : 4-dioic acid monoesters.

U.S.P. 2,599,123 (18.8.50; 3.6.52). P. S. Pinkney, B. C. Pratt and W. J. Wayne, assrs to E.I. du Pont de Nemours & Co. Copolymers of ethylene, an alkyl acrylate, and an alkyl hydrogen maleate.

U.S.P. 2,599,544 (31.1.51; 10.6.52). W. W. Crouch and J. F. Howe, assrs to Phillips Petroleum Co. Olefin–sulphur dioxide resins are stabilized by elemental sulphur or an inorganic sulphide.

U.S.P. 2,599,581 (2.4.48; 10.6.52). J. L. Perkins and E. E. Sylvester, assrs to B.B. Chemical Co. Cements for attaching shoe soles comprise a butadiene–acrylonitrile copolymer, basic zinc carbonate, resinous chlorinated paraffin hydrocarbon, and a vinyl chloride–vinyl acetate copolymer.

U.S.P. 2,599,640 (4.8.44; 10.6.52). R. M. Joyce, assr to E. I. du Pont de Nemours & Co. Copolymer of chlorotrifluoroethylene, vinyl acetate, and ethylene in the mol ratio 1 : 5·1 : 18.

U.S.P. 2,599,813 (2.1.51; 10.6.52). W. W. Crouch and J. F. Howe, assrs to Phillips Petroleum Co. Olefin–sulphur dioxide resins are made by reacting sulphur dioxide with an aqueous emulsion of a mono-olefinic compound, introducing into the resulting latex tin, tin oxide, tin hydroxide, or a tin salt (other than tin sulphide) and recovering the resin.

U.S.P. 2,600,454 (15.11.48; 17.6.52). J. E. Wicklatz and J. N. Short, assrs to Phillips Petroleum Co. Resinous materials from 1 : 2-dimethylene*cyclo*hexanes.

U.S.P. 2,600,943 (25.4.51; 17.6.52). E. A. Van Valkenburgh. Detackifying and cure activation compositions comprise a hydrocarbon diluent and stearine pitch overneutralized with a strong aliphatic amine.

U.S.P. 2,601,273 (8.6.50; 24.6.52). H. L. Gerhart, assr to Pittsburgh Plate Glass Co. Copolymers of *cyclo*pentadiene, an unsaturated glyceride oil, and an ethylenic compound containing a negative group. J. M. S.

CORROSION

208. Corrosion of various metals in liquid sulphur dioxide. J. Bollinger. *Schweiz. Arch. angew. Wiss.*, 1952, **18**, 321–42.—Physical characteristics of SO_2 are listed and solvent properties of the liq discussed. Corrosive action of gaseous SO_2 and scanty data on liq SO_2 are reviewed. H_2O tolerance of SO_2 was determined, for liq it is linear over range $-28°$ C (0·5%) to $+33°$ C (2·8%), for gaseous it is 0·07% ($-10°$ C) to 0·85% ($+25°$ C). Comparative tests on determination of H_2O in liq SO_2 by P_2O_5 and Fischer methods showed good agreement, former was preferred owing to relative instability of Fischer reagent during period of a prolonged investigation. Corrosion tests were carried out by measuring loss in wt of thin metal plates, mostly over fourteen days at 20° C. Four series of tests were made, using dry, O_2-free (<0·01%) SO_2; O_2-free, wet SO_2; dry, O_2-containing ($\frac{1}{2}$%) SO_2, and wet, O_2-containing SO_2. Experimental procedure is given in detail, including apparatus for analysis of evolved gases. Metals examined were Fe, Al, Cu, also Sn, Pb, Cd, Cr, Ni, Zn, Mg. Tests with Fe, Al, Cu were extensive, and full details are given, including discussion of reaction mechanism and energy balance. Attack by gaseous SO_2 was negligible (*ca* 1%) as compared with that by liq. Effect on Al was same as on Al alloy containing 97·3% Al, with Si, Mn, Mg, Fe; this alloy, more representative of constructional material than pure Al, was thus used for majority of tests. No attack on metals by dry liq; with 1% H_2O strong attack on Fe and Al but not on Cu, which requires presence of O_2 as well as water to become corroded. Stainless steel (18% Cr, 8% Ni) was quite unattacked by wet (50%) O_2-containing SO_2 over two months at 20° C. Presence of O_2 in addition to H_2O somewhat reduces attack on Al, due to formation of protective oxide film; result is a pitting type of corrosion by attack through pores in such film. Fe and Al are corroded when H_2O content>0·3 to 0·4%, below this concn H_2O is preferably retained in SO_2. Corrosion of Al only increases slowly with H_2O content, but, above 0·6%, rate of attack on Fe is almost linear therewith. H_2 evolution was observed only in case of attack by wet, O_2-free SO_2 on Al, all other cases of corrosion attack are reactions of the type in which final product is a metal salt and water, latter frequently in form of hydrate. If resultant metal salt is H_2O-sol and hygroscopic (*e.g.*, $ZnSO_4$) corrosion is greater than if it is insol and thus forms a protective layer (*e.g.*, $PbSO_4$). Effect of corrosion inhibitors (1%) dissolved in SO_2 was examined, efficacy of inhibitors varied towards different metals; hexamethylenetetramine was effective for protection of Fe and Al. V. B.

209. Hydrogen attack of steel in refinery equipment. Anon. *Ingenieur, 's Grav.*, 10.10.52, **64** (41), Ch.94–5.—A fairly extensive summary of the paper published under the same title by R. T. Effinger *et al.*, in the *Petrol. Refin.*, May 1951. (*See* Abs. 1981—1952.) G. F. T. C.

210. Hydrogen embrittlement tests on various steels. F. A. Prange. *Corrosion*, 1952, **8** (10), 355–7.—A simple test procedure is given for assessing the susceptibility of steels to hydrogen embrittlement under sour condensate well conditions. The test piece, under slight tensile stress, is made the cathode in a cell containing 5% sulphuric acid, and embrittlement is judged from the amount of cracking observed under standard conditions. K. G. B.

211. Cracking of high strength steels in hydrogen sulphide solutions. J. P. Fraser and R. S. Treseder. *Corrosion*, 1952, **8** (10), 342–50.—The cracking of steels under the conditions present in sour gas wells can occur in simple hydrogen sulphide solution. The mechanism proposed is a combination of stress corrosion cracking and hydrogen embrittlement. The important factors are metal composition, heat treatment, and type and magnitude of stress. A simple laboratory procedure is given for testing susceptibility to this form of corrosion. K. G. B.

212. Stress corrosion cracking of steel under sulphide conditions. C. N. Bowers, W. J. McGuire, and A. E. Wiehe. *Corrosion*, 1952, **8** (10), 333–41.—Laboratory and field studies confirm that the rapid failures of 9% nickel steel in a Canadian sour condensate well were due to stress corrosion cracking. Ordinary tubing steels are at

least equal to low alloy steels in resistance to the attack. The sensitivity to failure is primarily due to the presence of martensite in the structure, and is reduced or prevented if the martensite is eliminated. K. G. B.

213. Hydrogen sulphide corrosion cracking of steel. L. W. Vollmer. *Corrosion*, 1952, **8** (10), 326–32.—9% nickel steel tubing failed in six days in a well at Pincher Creek Field, Canada, containing 10% hydrogen sulphide and 6·3% carbon dioxide by volume. Laboratory tests suggest that the failure was due to stress corrosion cracking, and that it may occur with other steels treated to produce Rockwell C24 to C26 hardness. Embrittlement is not believed to be a primary cause. K. G. B.

214. Recording pipeline cathodic protection data. K. D. Wahlquist. *Oil Gas J.*, 13.10.52, **51** (23), 291.—A form is described for use with main transmission lines, but it can be used also to record conditions on and along local lines. G. A. C.

215. How to plan a practical magnesium anode programme. J. N. Hunter. *Oil Gas J.*, 13.10.52, **51** (25), 284.—Principles of cathodic protection are outlined, and uses of anodes to best advantage pointed out. Successful anodes are designed on basis of graphs reflecting results of past experience; and number required and life of each determined by soil-resistivity measurements and graphs. A punched card record can show location and replacement date of each anode. G. A. C.

216. Magnesium anode system resurveyed after 2½ years. C. E. Sonntag. *Oil Gas J.*, 13.10.52, **51** (23), 303.—A resurvey of the Chocolate Bayou transmission lines of Pan American Gas Co. after two years operation showed repair work on protection system to be necessary. Insufficient depth of installation of lead wires causing shear from shallow excavation and inadequate back filling were faults found. Recommendations to reduce casing problems are given. G. A. C.

217. Corrosion control in gas-lift wells. D. A. Shock and J. D. Sudbury. *Corrosion*, 1952, **8** (9), 296–9.—The corrosion is due to water acidified with carbon dioxide, and to measure the rate of attack coupons must be exposed at various depths down the well. Three liquid inhibitors have been injected into the annular space, two semi-polar organic materials and a high gravity aqueous solution based on sodium arsenite. Only the third was completely effective, but it is inadmissible for other reasons. Many inhibitors are unacceptable owing to chemical reaction with dissolved salts in the water. No solution to the problem has yet been found. K. G. B.

218. Patents. U.S.P. 2,598,725 (6.2.51; 3.6.52). D. B. Sheldahl, assr to Sinclair Refining Co. To prevent corrosion light petroleum distillate fractions are doped with an ammonium mahogany sulphonate and morpholine.

U.S.P. 2,598,949 (9.3.49; 3.6.52). D. I. Walker and F. A. Dieman, assrs to Standard Oil Co. Finger-print corrosion inhibiting composition comprising 1 to 30% oil-soluble sulphonate, 5 to 85% hydrocarbon solvent boiling between 100° and 650° F, 1 to 20% water-soluble aliphatic alcohol or ketone, 0·1 to 5% water-soluble sulphonated vegetable oil and 1 to 10% water.

U.S.P. 2,599,341 (29.10.47; 3.6.52). J. P. McDermott, assr to Standard Oil Development Co. Corrosion inhibitors for hydrocarbon oils are compounds of the formula

wherein R is an alkyl group of 3 to 8 carbon atoms, X is an oxygen or sulphur atom, n is 0 or 1, and m is 3 or 5.

U.S.P. 2,599,384 (8.4.50; 3.6.52). W. F. Gross, W. Groves, and C. C. Rogers, assrs to Petrolite Corpn Ltd. Solid stick corrosion inhibitors for oil and gas well equipment, consisting of lead oxide, barium sulphate, or metallic lead, a substituted imidazoline or partial salt thereof, an amorphous mineral wax, a cellulose ester or ether, and a coumarone-indene resin or a resin obtained by the extraction of brown coal.

U.S.P. 2,599,385 (9.7.51 ; 3.6.52). W. F. Gross, W. Groves, and C. C. Rogers, assrs to Petrolite Corpn Ltd. Solid stick corrosion inhibitors for oil and gas well equipment consisting of a finely divided weighting material, a substituted imidazoline, and an oxidized mineral wax.

U.S.P. 2,601,214 (2.5.47 ; 17.6.52). H. A. Robinson, assr to The Dow Chemical Co. A cathodic protection system for underground steel pipes comprises a magnesium anode buried in the earth near the pipe and electrically connected with it, the anode being surrounded by and in contact with a bed of non-acidic solid granular material containing magnesium sulphite. J. M. S.

Engines and Automotive Equipment

219. New design features of Sulzer engines. Anon. *Mot. Ship*, 1952, **33**, 283.—A brief review, with illustrations, is given of the new design features of the standardized large Sulzer marine engine, in regard to fuel valves, fuel pumps, and starting-air valves. U. M.

220. First B. and W. turbo-charged engine. Anon. *Mot. Ship*, 1952, **33**, 298.—Details are given of the installation in the 17,000-ton tanker *Dorthe Maersk* of a six-cyl turbo charged B. & W. engine which was described in the November 1951 and June 1952 issues of *Mot. Ship*. The ship has completed her trials, and the engine shows an increased output of 35% over the rating of the corresponding unsupercharged engine. U. M.

221. Recent Sirron high-speed [diesel] engine developments. Anon. *Gas Oil Pwr*, 1952, **47**, 237–9.—These engines are available in two types. The J models have cyl of bore 105 mm and stroke 152 mm and develop 10 b.h.p. per cyl at 1000 r.p.m. at a b.m.e.p. of 99 p.s.i. The pistons have three pressure rings and two oil control rings. Oil is pumped by a gear-type pump through a strainer and thence via a gallery to all bearings and gears.

The C models have cyl of bore 135 mm and stroke 200 mm, and develop 20 b.h.p. per cyl at 1000 r.p.m., corresponding to a b.m.e.p. of 91 p.s.i.

Constructional details of both engines are in general similar. The J models develop 10 to 60 b.h.p. with a fuel consumption of 0·4 pints/b.h.p.hr. ; corresponding figures for the C models are : 20 to 120 b.h.p. ; 0·36 pints/b.h.p.hr. H. C. E.

222. New Leyland horizontal [diesel] engine. Anon. *Gas Oil Pwr*, 1952, **47**, 233.—This six-cyl engine has cyl of bore 3·96 inches and stroke 4·75 inches, giving a capacity of 351 cu. in. The C.R. is 16 : 1, and the unit develops 90 b.h.p. at a max speed of 2200 r.p.m.

Details of the engine construction are fully described.

The Al-alloy pistons each carry three compression and two slotted oil-control rings, and have a toroidal combustion chamber in the crown. The main, big end, and camshaft bearings are pressure-lubricated through drilled passages from a gear-type pump in the sump. The valve gear is intermittently lubricated, and the oil passes through a full-flow filter, which is fitted with a by-pass for use if the filter elements become blocked. Cooling water is circulated by centrifugal pump and is thermostatically controlled at 165° F. A Simms fuel injection pump is used in conjunction with Leyland multi-hole injectors. H. C. E.

223. Six national engines for the Sarawak Oilfields Ltd. Anon. *Gas Oil Pwr*, 1952, **47**, 226.—National BARG8 diesel engines are each coupled to an English Electric alternator generating 500 kW at 6600 V in a central power station built to supply light and power throughout the oilfield. The engines run on natural gas of cal. val. *ca* 1140 B.Th.U., supplied to the engines manifolds at 2 inches w.g.

Each engine has a closed water-cooling circuit incorporating a heat exchanger, and operated by an electrically driven pump. Raw water is used for the heat exchanger and the engine oil cooler. H. C. E.

224. Werkspoor high-speed diesel engines. Anon. *Gas Oil Pwr*, 1952, **47**, 213–16.—These Vee type four-stroke engines have from eight to twenty cyl, giving a power range from 300 to 3000 b.h.p. Three cyl sizes are used: bore and stroke are 160 mm by 200 mm, 180 mm by 220 mm, and 215 mm by 260 mm, the max r.p.m. being 1400, 1350, and 1150 respectively. Buchi pressure charging is provided in all except the two smallest units.

Details of the engine construction are given.

Engine lubrication is provided by two pumps at a pressure of 28 to 42 p.s.i., dependent on engine speed, to the main bearings. The valve gear is lubricated at 5 to 6 p.s.i., and an auxiliary pump is used for priming the crankshaft bearings and setting the centrifugal governor prior to starting. The pressure chargers supply air to the cyl at up to 21 p.s.i., and a mean effective pressure of 185 p.s.i. can be obtained if the air passes through an after-cooler. When large supplies of low temp water are not available for air cooling a max pressure of 142 p.s.i. only is obtainable.

Advantages of the four stroke over the two stroke cycle are given. H. C. E.

225. Allen marine gas turbine trials. Anon. *Gas Oil Pwr*, 1952, **47**, 210–12, 216.—The gas turbine described previously (Abs. 819—1952) has now been fitted with a heat exchanger of the two-path cross-flow type. The basic design particulars are listed under twenty-one headings.

An improved method of starting is to energize a glow plug in one of the combustion chambers and motor the compressor rotor to 500 r.p.m. before supplying fuel, which ignites at about 1000 r.p.m. The starting motor is shut off at *ca* 3500 r.p.m., and normal running speed is reached at 4700 r.p.m. A series of graphs illustrates the performance of the unit under steady conditions and sudden load changes.

H. C. E.

226. American 5000 b.h.p. gas turbine. Anon. *Gas Oil Pwr*, 1952, **47**, 243.—This unit comprises a four-stage compressor, six combustion chambers, single stage H.P. and L.P. turbines, and heat exchanger. The compressor is driven by the H.P. turbine. The output of the unit is obtained from the L.P. turbine, which has twenty-four movable guide vanes. These possess the following advantages: (1) over-speeding can be limited; (2) the fuel consumption is improved at low loads; (3) the output at high ambient temps is increased; (4) auxiliary power can be taken from the gas generator set; (5) starting power is reduced; (6) operation under no-load conditions is possible without exceeding the rated speed of the power turbine and without excessive exhaust temps. Starting is accomplished either by electric motor or by a turbine using gas, steam, or air. A number of safety devices are fitted. H. C. E.

227. Axials, centrifugals and the by-pass engine. Anon. *Aeroplane*, 31.10.52, **83** (2154), 608.—Although there are many centrifugal compressors still in service, development in Britain and America has produced greatly improved axial compressors, and now centrifugals have been eclipsed and all engines built since the war have axials. These two types of compressor are compared from the points of view of efficiency, production, and maintenance. Broadly, the axial has the ability to give a considerably higher pressure ratio, a higher efficiency, and a small frontal area, all of which give a valuable advantage in aircraft performance. The centrifugal is more easy to make, to develop, and to keep serviceable.

The article also discusses ducted-fan and by-pass engines, including the application of after-burning to the cold fan stream in both types of engine. U. M.

228. New centrifugal oil filter. Anon. *Gas Oil Pwr*, 1952, **47**, 242.—In this unit the filter bowl rotates on a central spindle which is screwed to the stationary body of the unit. Oil under pressure enters through the hollow spindle and fills the filter bowl. It escapes through two standpipes and emerges through nozzles which form high-speed jets, the reaction of which spins the filter bowl and imparts a centrifugal action to the oil, causing insoluble matter to be deposited on the sides of the bowl.

The filter is designed to work at a min oil pressure of 30 p.s.i., giving a rotor speed of 3500 r.p.m., and will then pass 55 g.p.h. At 70 p.s.i. the capacity is 95 g.p.h. The unit is intended for use on engines of 60 to 120 b.h.p. H. C. E.

229. Patents. U.S.P. 2,598,849 (Switzerland 11.5.49; 3.6.52). K. Sonderegger, assr to Schweizerische Lokomotiv- und Maschinenfabrik. Oil-cooler arrangement in air-cooled I.C. engines.

U.S.P. 2,599,851 (France 24.7.41; 10.6.52). R. H. Marchal and O. Y. Durouchoux, assrs to Société Nationale d'Etude et de Construction de Moteurs d'Aviation. Method of lubricating I.C. engine pistons.

U.S.P. 2,599,908 (18.3.46; 10.6.52). G. R. Gehrandt. C.I. engine with automatic variation of the volume of the combustion space controlled by the speed of the engine.

U.S.P. 2,599,915 (23.7.47; 10.6.52). H. Hersch. Fuel distribution system for I.C. engines.

U.S.P. 2,599,985 (31.5.46; 10.6.52). S. S. Fox and R. B. Talbot, assrs to United Aircraft Corpn. Anti-detonant injection control for I.C. engines. The fuel flow is decreased by a pre-determined amount, and after a pre-determined lapse of time water is introduced into the engine.

U.S.P. 2,600,440 (17.5.50; 17.6.52). D. H. Smith. In I.C. engines the piston head is convexedly domed and is provided with a cup-shaped recess opposite to the injection nozzle and a number of fluted, equally spaced, radially extending channels leading from the recess to the periphery for producing a controlled swirling action of the gases in the cyl.

U.S.P. 2,600,529 (19.6.46; 17.6.52). A. T. Gregory, assr to Fairchild Engine and Airplane Corpn. Engine cyl construction for cooling valve seat inserts.

U.S.P. 2,600,612 (12.10.46; 17.6.52). F. G. Bollo, assr to Shell Development Co. Aircraft power control system for adjusting and maintaining the operation of the engine at a predetermined h.p.

U.S.P. 2,600,736 (15.6.51; 17.6.52). W. R. Crooks, assr to The Cooper-Bessemer Corpn. Air supply to I.C. engine is conditioned by evaporating water into it to reduce its temp, passing the air through the charging blower and a heat exchanger to the engine manifold and circulating water through the heat exchanger and returning it as spray to the air stream prior to its entry into the blower.

U.S.P. 2,600,810 (30.6.50; 17.6.52). F. J. St. Lucas. C.I. engines are fitted with a motor adapted to move in response to a predetermined pressure in the crankcase, and means for stopping the engine which are put into action by movement of the said motor.

U.S.P. 2,601,344 (10.9.49; 24.6.52). A. Townhill, assr to Thompson Products Inc. Piston with a depending ring flange, pin bosses on the ring flange, and skirts of larger dia than the ring flange at both ends of the ring flange and connected to the ring flange on the pin boss sides only of the piston.

U.S.P. 2,601,404 (12.4.50; 24.6.52). T. S. Lasky. Oil filter.

U.S.P. 2,601,525 (3.2.49; 24.6.52). A. M. Howald and L. S. Meyer, assrs to Libbey-Owens-Ford Glass Co. Bulletproof fuel tank having a gasoline-resistant flexible lining, a rubbery sealing layer which swells rapidly but does not dissolve in gasoline, and a non-metallic non-shattering stiff supporting member. The supporting member is composed of layers of fibrous material interspersed with hard resinous material.

U.S.P. 2,601,562 (16.2.50; 24.6.52). K. P. Schoeppner and C. F. Zaitz, assrs to Harnischfeger Corpn. Priming apparatus for I.C. engines. J. M. S.

Safety Precautions

230. Avonmouth fire. Anon. *Inst. Pet. Rev.*, 1952, **6**, 400-3; *Petrol. Times*, 28.11.52, **56**, 1006.—This is a summary of the report by the Institute of Petroleum Engineering Sub Committee on H.M. Chief Inspector of Explosive's findings on the fire at Avonmouth on 6 September 1951, and gives comments on Dr Watt's recommendations. G. A. C.

231. Explosion accident caused by propane gas installation. —Neidiger. *Brandschutz*, 1952, **6**, 179; *Erdöl u. Kohle*, 1952, **5**, 563.—Explosion following bursting of safety disk of 5-kg propane bottle stored 3 ft from coal fire caused three severe casualties (one fatal). Desirability of prohibiting propane storage within houses, as against discouragement of expansion of use of L.P.G., is discussed. V. B.

232. New foam–water extinguisher vehicle for the petroleum industry. A. Elste and K. Mobius. *Erdöl u. Kohle*, 1952, **5**, 645–6.—Illustrated description of three-axle, all-wheel drive, 70 km/hr, 9-ton vehicle. Power unit is 95-h.p. C.I. engine, delivery 2500 litres/min against 80 m head; venturi type mixer enables up to 6% foam compound to be used. Foam container has capacity 2000 litres, which, at usual 3·5% concn, enables 23 min operation yielding 380 m^3 foam. This is adequate for coverage of 18-m-dia tank. Vehicle is designed for one man operation, and applicability to protection of tank farms is described. V. B.

233. Electrical installation. B. Z. Segall. *Oil Gas J.*, 20.10.52, **51** (24), 185; 27.10.52, **51** (25), 139; 3.11.52, **51** (26), 133; 10.11.52, **51** (27), 165.—No. 141 of the Refiner's Notebook begins a series on electrical installations. Pt 1 deals with Code requirements, setting out the three main classifications for hazardous locations and discussing wiring system for the first class.

Pt 2 is on explosive limits, and deals with classifying hazardous locations, inspection, and explosion-proof equipment.

Pt 3 is on explosion-proof equipment. Flanged and threaded joints are compared, and figures show how escape of flames is prevented.

Pt 4 deals with wiring methods. Figures show use of electrical metallic tubing in hazardous locations. G. A. C.

234. Make your research " lab " safe. N. W. Jacobsen. *Petrol. Process.*, 1952, **7**, 1267–9. (*API divn of Refining, Session on Analytical Research, mtng* 12–15 *May* 1952, *San Francisco.*)—Research personnel should be able to combat hazards that are liable to occur in the laboratory by a diligent programme of safety consciousness.

The six recognizable safety problems that occur in analytical research are considered, such as the storage of flammable liquids, and the toxicity of chemical reagents, etc.

Adequate shielding of analytical apparatus, the necessity of warning notices in the vicinity of flammable, explosive, or toxic chemicals, and such measures that are thought necessary in the face of ignorance or carelessness by inexperienced laboratory personnel, are among the many factors to be studied in order to make the laboratory absolutely safe. J. W. H.

235. Patents. U.S.P. 2,599,796 (Sweden 31.10.49; 10.6.52). A. E. Wicklander. Apparatus for extinguishing fires in tanks containing inflammable liquids involving means for projecting an envelope containing a fire extinguishing medium from an inlet below the level of the liquid to the space above said level. The envelope is constructed so that it is impervious to the liquid in the tank, but at least a portion of it is fusible.

U.S.P. 2,600,455 (31.8.50; 17.6.52). J. V. Wilson and R. Maratta, assrs to Monsanto Chemical Co. Fire-retardant compositions comprising a water-dispersible aldehyde-amine condensation product and a reaction product of phosphorus pentoxide and ammonia which is insoluble in cold water. J. M. S.

Miscellaneous

236. Energy in the service of man. R. H. Macmillan. *Nature, Lond.*, 1952, **170**, 611.—A series of six papers presented in Paris under the auspices of UNESCO:

Civilization and the use of energy.

World sources and consumption of energy. Discusses water power, wind, and solar radiation as well as the expendable forms of energy such as coal, oil, and nuclear fuels.

Utilization of energy. Mainly thermodynamic, with discussion of the efficiences of various forms of apparatus for particular uses.

Energy in its international aspects. Geographical distribution of energy sources and the world movements of fuel, electricity grids, oil pipelines, etc. The transport and storage of energy is compared for energy in its different forms.

The role of energy in under-developed areas. The comparative development of various countries and the distribution of resources.

Energy in the future. Discusses the present efficiency of energy utilization, the power sources now available, and the prospects of obtaining significant amounts of energy from nuclear sources and from solar radiation. H. C. E.

237. U.S. Federal Trade Commission alleges an international oil cartel. Anon. *Petrol. Times*, 1952, **56**, 839, 879, 924, 971.—Extracts from a highly detailed report of 378 pages are given. Pt I deals with resources and concentration of the world petroleum industry, Pt II with development of joint control over the international petroleum industry.

Summaries from Pt III deal with production and marketing agreements—and with a case history—U.K.

In the third article on the report, a summary of the final chapter, entitled Price Determination, is given. G. A. C.

238. Background and future of the "oil cartel" charges. J. M. Collins. *Petrol. Times*, 28.11.52, **56**, 1003.—A review is given of the beginning of the investigations and of contentions in the Report, and the possibilities of the investigation being carried to a conclusion in the Courts. G. A. C.

239. Persian reply to Anglo-American proposals in oil dispute. Anon. *Petrol. Times*, 3.10.52, **56**, 855.—The Persian Government's reply to the Churchill-Truman proposals for settling the oil dispute was published in London on 25 Sept. 1952. The essence of the Persian attitude is summed up under four articles at the end of the Note outlining the conditions under which Persia would be prepared to accept arbitration by the International Court of Justice on the question of compensation. The four conditions are reported verbatim. G. A. C.

240. Romance of power and fuels. J. E. Toby. *Mech. Engng, N.Y.*, Oct. 1952, **74** (10), 812.—The development of the power and fuel industries in the U.S. is described. Despite the impact of liquid fuels, annual coal production in the last fifty years has consistently increased. A general picture of the U.S. petroleum industry is given, and it is stated that in 1950 the petroleum industry was a $30,000,000,000 operation, employing 1,800,000 people. It is suggested that atomic energy will not supplant other sources of energy as long as low-priced traditional fuels are available. T. T.

241. Petroleum and natural-gas research programme, Bureau of Mines, fiscal year 1951. R. A. Cattell and others. *Inform. Circ. U.S. Bur. Min.* 7643. Aug. 1952. 46 pp.—Research of a varied character is described, including oil and gas development and production, secondary recovery, chemistry and refining, thermodynamics of petroleum, transportation of natural gas, and helium-tracer studies.

The *oil producing* possibilities of the Canyon Reef fields of Scurry, Borden, and Kent Counties, Texas, received much consideration. Special attention was also given to the productivity of high-pressure oil and gas wells, the characteristics of reservoir-oil samples, and the behaviour of different drilling fluids and effects of their filtrates on core analysis.

In *secondary recovery* production methods, a number of water flooding projects were carried out in Oklahoma, and a comparison was made of the results obtained by the use of different techniques and types of equipment. A graph is given showing the effect of water flooding on oil production over a period of twenty years.

Chemistry and refining research was designed to provide basic information on the relationships of the composition of petroleum products and their utilization. The research included crude oil analysis, sulphur compounds in petroleum, and composition and properties of asphalts.

In the *thermodynamics of petroleum*, various investigations were made: low temp

calorimetry, vapour heat capacity and heat of evaporization, vapour pressure, and statistical mechanical calculations.

On the *transportation of natural gas*, three important phases of research were conducted: (1) removal of excess nitrogen, (2) development of a dew-point recorder to improve plant and pipeline operation, and (3) the flow of gas in pipelines.

Investigations on the use of *helium* as a tracer gas in petroleum reservoirs continue to give results of much interest to the oil industry. Two projects in Texas and one in California were begun; in one instance the tracer helium appeared within approx 24 hr in the gas produced from wells adjacent to the injection wells. Reports covering this work were published in 1950 and 1951. G. S. S.

242. Canada's petroleum and natural gas resources. G. S. Hume. *Canad. Min. metall. Bull.*, 1952, **45**, 515–17.—Data, from official sources quoted, are given of the reserves, production, and consumption of crude oil and natural gas in Canada, and some comparisons are made with the U.S.A. figures. The estimated recoverable reserves as of 31 Dec. 1953 are shown, the estimated ultimate reserves are noted, and the possible daily oil production of Western Canada at efficiency rates of 6, 7, and 8% are given for Oct. 1951, and as at 1954 and 1955. The estimated recoverable reserves of natural gas at Aug. 1951 are given. Pipelines for transportation in Canada and to the U.S.A. are described. The bituminous sands of the McMurry area and their possibilities are briefly described. W. H. C.

243. Oil refining in Britain. Anon. *Times Rev. Ind.*, Nov. 1952, **6** (70), 10–11, 13.—Growth of British refining industry since war is outlined, and reasons therefor given. Capacity in 1953 will be 26½ million tons/year, 8 million tons/year in excess of domestic requirements, surplus being largely fuel oil. British refineries are listed, with crude throughput capacities in 1938, 1946, and 1953; map showing their location is given. V. B.

244. United Kingdom petroleum made in August and the eight months. Anon. *Petrol. Times*, 3.10.52, **56**, 831.—The statement shows that imports of crude petroleum in Aug. 1952 have risen by 10% above the low July level. Motor spirit exports greatly exceed the average. G. A. C.

245. Process developments in the U.S.A.—1. Anon. *Petroleum, Lond.*, Nov. 1952, **15** (11), 301–4.—Reviews process developments in the U.S. oil industry which are of interest not only because of the survey of recent progress, but also because some of the processes described are either little known or little used in Europe. Pt 1 deals with such catalytic processes as the Houdry, Thermophore, and fluidized catalyst processes, and separation processes. The latter section covers hypersorption, solvent extraction, and distillation, with brief descriptions of packed columns, including the Stedman column. R. E. P.

246. Forecasts for petroleum chemicals. Anon. *Petrol. Process.*, 1952, **7**, 1289–93.—In a recent report, "Resources for Freedom," the President's Materials Policy Commission have predicted a five-fold increase in output of primary petrochemical products in the U.S. by 1975. A further $5200 million will have to be invested in new plants to meet this increase.

Summaries of hydrocarbon raw material requirements, investment and approx metal requirements, that will be needed in the future to meet the demand, are given in tabular form.

It is assumed that petroleum will continue to increase in importance as a source of energy requirements. J. W. H.

247. Foreign petrochemicals. Canada builds a new empire. Anon. *Petrol. Process.*, 1952, **7**, 1300–5.—By the end of 1953 the Canadian Petrochemicals industry will have tripled its present size. Of the four plants now in operation, two of them are being expanded. Nine new petrochemical plants are under construction at a cost of over $100 million.

Further development in northern Alberta, Canada's greatest industrial province, is expected in the next few years. Gross value of oil and gas reserves in Canada at the present time is estimated to be over $5 billion. J. W. H.

248. Where petrochemicals come from. Anon. *Oil Gas J.*, 20.10.52, **51** (14), 174.—Tables show vol % of paraffins, naphthenes, and aromatics in straight-run fractions boiling in 97° to 320° F range; vol % of individual hydrocarbons in straight run base stocks from the same sources in same boiling range; the vol % of seven carbon-atom naphthenes and toluenes in crude oil, condensate, and natural gasoline samples; and petrochemicals in Mid Continent naphthas. G. A. C.

249. Sulphur production and manufacture of sulphuric acid. I. Raw materials and principal processes. B. Waeser. *Erdöl u. Kohle*, 1952, **5**, 497–9.—Statistics, SO_2 production, working up of SO_2 of low concn, H_2S and organically combined S, H_2SO_4 production by contact method, distribution of H_2SO_4 production (pet industry takes 19% of world production). **II. Utilization of S from coal and oil.** 575–7.—Processes and patents for recovery of S from coal and, especially, pet, reviewed. **III. Sulphuric acid from coal or petroleum sulphur.** 648, 651.—Combustion of S, combustion of H_2S, processing of waste acid and acid sludge. Total of sixty-three refs. V. B.

250. Achievements in Soviet Union as example for Polish refinery technique. W. Sliwinski. *Nafta (Krakow)*, 1951, **7**, 293–7.—Requiring petroleum for its agriculture and Army, the U.S.S.R. continued the work of Mendeléev, Markovinkov, and Gurvich, and development of industry is traced from 4·5 million tons in 1921 to 35 millions in 1950 and 60 millions in the near future. Exploitation of diverse reservoirs necessitates use of diverse refining methods. Progress in refining and various applications of refining by-products are mentioned. M. S.

251. First congress of power engineers of petroleum industry in U.S.S.R. Anon. *Nafta (Krakow)*, 1951, **7**, 319.—Took place in Moscow in Apr. 1951 to discuss new sources of energy and economies in use of fuels and electricity. M. S.

252. Follow the drum. A method of control. S. G. Green. *Petrol. Times*, 14.11.52, **56**, 966.—A system is evolved, which requires only one additional man having a knowledge of double-entry bookkeeping, by which drum "losses" can be controlled. A chart of drum stock records is shown, and some explanatory notes are given on the accounts. G. A. C.

253. Metallurgy of welding of austenitic chromium–nickel steels. F. H. Keating. *Ingenieur, 's Grav.*, 3.10.52, **64** (40), W71–81.—Metallurgical problems associated with the welding of the chromium–nickel silver austenitic steels are discussed, and the effect of these problems on the development of the steels is shown. Consideration is given to outstanding metallurgical problems still awaiting solution, and suggestions are put forward as to the trends of future developments. G. F. T. C.

254. Weather and oceanographic problems in the petroleum industry. A. H. Glenn. *J. Petrol. Tech.*, Apr. 1952, **5** (4), 19–21.—Weather and oceanographic matters impinge on oil operations as varied as exploration, production, pipelines and refining, aviation, marketing, tanker operation, and research. Within these main items more specific features have been listed. There are relatively few quantitative studies which include the costs where weather or oceanographic data are involved. The government weather services in general have far more specific data than are publicly released, and these data would assist in oil operations. In addition, such services do not always employ the latest available techniques. There is a five to ten year lag between the development of economically valuable weather on oceanographic data or techniques and their incorporation into government services. Consultant services should maintain close contact with the actual industrial problem to avoid costly mistakes or misuse of data. For most problems some complete or partial solution can be devised, but it is necessary to do this economically. Costs will vary widely, according as use is made of normally available or of specially acquired data. The best solution is not solely dependent on better weather forecasting, but more often on better application of such data. G. D. H.

255. Patents. U.S.P. 2,592,612 (2.8.47; 15.4.52). W. J. Smith, assr to Cleveland Steel Products Corpn. Rotary liquid fuel feeder for flame ring burner.

U.S.P. 2,592,827 (28.2.48; 15.4.52). P. Schell, assr to Penn Controls Inc. Oil burner safety control system.

U.S.P. 2,592,847 (20.1.48; 15.4.52). G. Babicz. A photo-cell apparatus responsive to combustion failure and adapted to control a liquid fuel burner having means for injecting air under pressure into the tube connecting the photo-cell with the interior of the furnace.

U.S.P. 2,593,166 (25.11.47; 15.4.52). H. H. M. Meyer, assr to Phillips Laboratories Inc. Fuel oil vaporizer.

U.S.P. 2,593,849 (11.7.49; 22.4.52). A. E. Clarke, A. K. North, K. H. Holliday, and J. S. Clarke, assrs to J. Lucas Ltd. Liquid fuel burner with diverse air paths and fuel vaporizer.

U.S.P. 2,593,884 (30.7.48; 22.4.52). R. J. Ifield, assr to J. Lucas Ltd. Oil burner nozzle.

U.S.P. 2,594,206 (26.3.47; 22.4.52). W. H. Payne. Oil burning plant including an electromagnetic control unit.

U.S.P. 2,594,234 (19.8.46; 22.4.52). N. Swindin. Submerged flame burner for heating liquids with heavy fuel oils.

U.S.P. 2,594,412 (29.1.46; 29.4.52). H. L. Finley, assr to General Bronze Corpn. Igniter for oil burners. R. C. R.

BOOK REVIEW

Mineral Oils and Related Products. Ed. Carl Zerbe. Berlin: Springer Verlag. London: Lange, Maxwell & Springer Ltd., 1952. Pp. 1525 + L. DM192, £16 16*s*.

Despite its magnitude, this volume is a highly specialized reference book for the benefit of people concerned with the development of mineral oil products. Its purpose is to include in one volume all the latest methods of investigating, characterizing, and utilizing mineral oils. Though published in 1952, references are in most cases as recent as 1951.

The chapters on related products, animal and vegetable oils and fats, naturally occurring resins and waxes, and so forth are a very useful complement to this book, since it is most important that the oil chemist should know what he has to compete with from other sources. These incidental subjects are allowed only as much space as their relative importance deserves. Thus silicone lubricants are succinctly described in one page, with twelve general references for those interested in more detail. More than thirty authors have contributed, each in his own specialized field, but there is no confusion and no unnecessary repetition, the main theme being developed systematically throughout the book.

General methods of testing, which form the first chapter, are subdivided into physical, spectroscopic, and chemical analysis. These are given with sufficient detail to permit practical tests without further reference to literature. German standard tests (DIN) are complemented in most cases by ASTM and IP methods.

The various fractions of crude oil are next described, with a separate chapter for engine fuels and another for lubricants. It is superfluous to list sections of these three chapters in detail, as the readers of this review will no doubt be conversant with them. Let it suffice to say that lubricants, *e.g.*, are covered in 289 pages.

Coal tar and its distillation products are described with nearly as much detail as petroleum.

Chapter VI deals with hydrogenation as applied to coal and petroleum products. This is possibly the least satisfactory chapter, as it is too short to give any useful detail. The nature of catalysts and even the nature of products in the case of petroleum are only hinted at quite cursorily. There is also an outstanding lack of references in comparison with other sections.

Though short, the chapter on Fischer–Tropsch synthesis is a good introduction to the subject and well referenced up to 1949.

Ozokerit, ceresin, and montan wax are the subject of Chapter VIII, genesis, properties, production, utilization, and test methods being given.

Nearly one hundred pages are devoted to animal and vegetable fats and oils. Analytical tests are necessarily closely related to those for mineral oils, and are given with sufficient detail. Analysts in both fields will undoubtedly benefit by this juxtaposition. Production and refining are briefly described. Glycerin, sulphated oils, blown oils, and wool fats end this chapter.

Chapter X discusses resins, natural and synthetic, turpentine oils and waxes.

A final short chapter deals with bleaching earths in some detail, since they have gained prominence in the refining of all types of oils.

This summary of the contents cannot end without mentioning the most valuable feature of this book, an index of nearly one hundred pages which makes it remarkably easy to find what one is looking for.

The emphasis is always on the testing of products, though innumerable other matters are included such as economics, statistics, specifications (and the reasons therefore), and even Customs regulations.

To sum up, one may well say that this single volume covers a vast field of knowledge and practical experience which though elementary to the specialist is most elusive in the original literature.

The English reader will be relieved to hear that several tables give translations of oil terminology wherein American and English are treated as separate languages. The German text is written in a plain straightforward style which is readily understandable.

The popularity of this book outside Germany would almost certainly be greatly enhanced by an English index. Because of the lack of context, this is the most usual stumbling block, and yet it is a vital part of any reference book. M. M. W.

ADDITION TO THE LIBRARY

Laboratory Course in Chemical Analysis. E. Sydney Davies and G. V. Jeffreys. London : English Universities Press, 1952. Pp. 96. 6*s*. 6*d*. net.

This new volume in "The Technical College Series" is primarily intended for part-time students preparing for National and Higher National Certificates in Chemistry. Its two sections—volumetric analysis and quantitative analysis—certain basic information for those preparing for more academic courses, and it should also be useful to junior chemists in chemical and metallurgical laboratories.

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Oilfield Exploration and Exploitation

Geology

256. Origin of petroleum. *Industr. Engng Chem. (Industr.)*, 1952, **44**.—Details are given of papers presented at a meeting of the American Chemical Society including the following :—

Evolution of petroleum. J. G. McNab, P. V. Smith, Jr., and R. L. Betts, 2556–63.—Reports results of a study of crude oil assay data for U.S. oilfields in addition to thermal cracking experiments on some Venezuelan and Canadian oils. Study emphasizes that chemical changes can occur in crude oils after reservoir accumulation. Cracking studies indicated that a "young" crude would be unaffected by 150° F, but would be 98% converted to lighter products after 400,000,000 years at 250° F.

Bacterial Aspects. R. W. Stone and C. E. Zobell, 2564–7.—Experiments carried out over a period of years have indicated that bacteria may enter the petroleum genesis at various stages, but no proof has been found that they can produce significant quantities of hydrocarbons other than CH_4 from animal and vegetable matter.

Optical activity. T. S. Oakwood, D. S. Shriver, H. H. Fall, W. J. McAleer, and P. R. Wunz, 2568–70.—Optical activity has been of importance in discussing the origin of petroleum. Work reported concerns the isolation of optically active constituents of petroleum.

Evidence of catalytic action in petroleum formation. B. T. Brooks, 2570–7.—Evidence is submitted indicating that principal source material has been unsaturated fatty oils, and the probable intermediate materials, heavy bitumens, have been slowly changed to typical petroleums by carbonium ion reactions induced by acid silicate catalysts. E. J. C.

257. Revised nomenclature for depositional coastal features. F. P. Shepard. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 1902–12.—In this paper the author attempts to give precise names and definitions to the marine depositional features along the coasts, with special emphasis on their geometry rather than hypothetical origin.

Distinct separations are made between "bars," that is submerged deposits extending along the coast, and "barriers," which are emerged deposits. The author also suggests a classification of cusp-shaped features. E. N. T.

258. Are Petaluma horse teeth reliable in correlation? R. A. Stirton. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 2011–25.—Knowledge of the sequence of equine species had not progressed far enough to permit age or stage refinement in correlation from the description of the Petaluma horse, *Neohipparion gidleyi* in 1915. Three genera are now recognized among the horse specimens that were originally considered of Lower Pliocene age.

Recent revaluations of the associated plants and molluscs show that they are indicative of Middle Pliocene age for the formation, and some of the most recent

geological papers have not used the evidence of the fossil vertebrates in the Petaluma formation, but have continued to correlate the Petaluma with the Siesta or the Orinda (Clarendonian) of the Berkeley Hills.

Should, however, *N. gidleyi* prove to be not a later Middle Pliocene species, then our concepts of the evolution in later Cenozoic Equidae are erroneous. E. N. T.

259. Texaco finds new area in Louisiana field. Anon. *Petrol. Engr*, July 1952, **24** (7), B98.—2 Sorrento Dome Land Corpn, Ascension Parish, Louisiana, on test from 8484 to 8496 ft flowed 2,750,000 cu. ft. gas/day plus 41·52 brl of 54·9° condensate. C. A. F.

260. Superior well opens field. Anon. *Petrol. Engr*, July 1952, **24** (7), B104.—1 Rockefeller, Cameron Parish, South Louisiana, which discovered the Deep Lake field, flowed 94 brl of 47·4° condensate and 7,838,000 cu. ft/gas in 8 hr. Gas-condensate ratio was 83,179 : 1, and pay was sand at 11,242 to 11,250 ft. C. A. F.

261. Maxie field discovery completed by Ohio oil. Anon. *Petrol. Engr*, July 1952, **24** (7), B100.—1 Coleman–Powe, Forest County, Mississippi, which discovered the Maxie field, on test of the Eutaw sand from 7303 to 7320 ft flowed at 1,195,000 to 4,242,000 cu. ft. gas/day and 16·07 to 80·76 brl condensate and oil/day. C. A. F.

262. Amerada wildcat flows 28 brl of oil an hour. Anon. *Petrol. Engr*, July 1952, **24** (7), B100.—1 Reinert Skaar, 8 miles north of Tioga, North Dakota, on test from 8190 to 8220 ft produced gas after 75 min and oil 35 min later; 28 brl oil were produced.

The Tioga field is believed to be separate from the Beaver Lodge field, where commercial production was first found in North Dakota. C. A. F.

263. Photogeology in the Williston Basin. L. Desjardins. *Petrol. Engr*, Aug. 1952, **24** (9), B62.—Many countries in the North Dakota and Montana parts of the Williston Basin can be mapped in detail by photogeology. This is of particular value in this area, as oil discoveries so far have been related to structures apparent at the surface.

There are two main problems in the photogeological interpretation of the Williston Basin: the first concerns the interpretation of outcrops in "badland" areas, where beds consist of very many thin hard beds scattered through softer material, and it is essential to measure at frequent intervals scaled columnar sections of the beds by photogrammetric measurements in order to establish exact correlation and to avoid "jumping beds." The second problem concerns structural contouring of very flat-lying beds in a topographical setting relatively lacking in natural indications of true horizontality. The method of solving this problem, using a visible, adjustable, artificial, horizontal plane in the stereo picture by means of a series of "floating lines" is described in detail.

Two annotated and contoured aerial photos of part of Dawson County, Montana, typical of the Williston Basin, are included. C. A. F.

264. Texaco pool opener seen in Williston Basin area. Anon. *Petrol. Engr*, Sept. 1952, **24** (10), B138.—NCT 4, 1, Dawson County, Montana, on test of the Ordovician from 10,004 to 10,100 ft recovered 2880 ft of green 40° oil. Top of Ordovician is at 9274 ft.

Gas estimated at 58,000 cu. ft/day was also recovered. C. A. F.

265. Sun gets gas, oil wells in Clare County, Michigan. Anon. *Petrol. Engr*, July 1952, **24** (7), B100.—1 Iutzie *et al*, Clare County, Michigan, was completed for 100 b.d. after acid treatment at 5213 ft.

1 Iutzie-Wood *et al* found gas in the Marshall at 1469 ft; production was 9,600,000 cu. ft/day. C. A. F.

266. Ash Creek discovery is newest and farthest north field in Great Powder River Basin. W. E. West. *Petrol. Engr*, Sept. 1952, **24** (10), B54.—The Ash Creek field in Sheridan County, Wyoming, was discovered by Barry 1 in May 1952, with an initial production of 200 b.d. The field is the most northerly in the Powder River Basin, and pay is approx 20 ft of Cretaceous Lower Shannon at approx 4400 ft. Average permeability of sand is 200 mD and porosity approx 20%.

Oil is being trucked to a pipeline at Midwest. C. A. F.

267. What sparks the Powder River Basin? J. Menneer. *Petrol. Engr*, Sept. 1952, **24** (10), B38.—Although much exploration and development has been carried out in the Powder River Basin in Wyoming for thirty years, much remains to be explored, particularly the northern area, where Ordovician rocks have been found to be productive at the southern end of the Williston Basin.

The Powder River Basin has an area of approx 35,000 sq. miles, and is essentielly a structural syncline containing rocks ranging from Cambrian to Tertiary. Eocene rocks crop out in the central part, and they are flanked by successively older rocks.

Fields have been developed in structural and stratigraphical traps. Structural traps are commonly domes, and are characterized by multiple pays, *e.g.*, Salt Creek and Lance Creek. Stratigraphical traps are largely developed in the Lower Cretaceous, and single zones are the more common. Formations currently producing are the Pennsylvanian, Jurassic, Lower Cretaceous, and Upper Cretaceous; major production is from the Cretaceous, and there are two general oil types present in the basin: Pennsylvanian (20° to 25°), and Jurassic and Cretaceous (average 35°).

The development of the South Glenrock field, where pays are at approx 5000 ft, is outlined. C. A. F.

268. Sussex and Meadow Creek fields. F. C. Sims. *Petrol. Engr*, Sept. 1952, **24** (10), B7.—The Sussex and Meadow Creek fields, in the southwestern part of the Powder River Basin, were discovered by Sussex Unit 1, and completed in 1948 in the Lakota sand for an initial production of 350 b.d. of 41° oil. The well was sited following surface reconnaissance and gravity and seismic work. Subsequent development found additional pays in Sussex and Shannon sands, and in 1949 a second Lakota pool was found 2½ miles to the east. To date six pays have produced oil, and four additional zones await development; the producing zones are the Sussex, Shannon, First Wall Creek, Second Wall Creek, Lakota, and Tensleep sands; and the Teapot, Parkman, Sundance, and Amsden (?) have tested oil.

The Sussex and Meadow Creek fields are on a broad structural terrace on the northeast flank of the Salt Creek anticline; plunging noses cut by transverse faults have been found at depth.

A geological map of the southwestern part of the Powder River Basin, a contour map of the Lakota sand, and representative electric logs of the Sussex and Meadow Creek areas, are included. C. A. F.

269. More oil and more surprises from Powder River fields than any Rocky Mountain area. M. Goodin. *Petrol. Engr*, Sept. 1952, **24** (10), A53.—Oil development in the Powder River Basin in the Rocky Mountain area of the U.S.A. since the discovery of the Shannon pool in 1889 is described. Notable fields which have been found are: Salt Creek, Teapot Dome, Big Muddy, and Lance Creek.

After curtailment of production in the mid-1920s renewed exploitation in the early 1940s resulted in the discovery in 1948 of fields in the Sussex–Meadow Creek area near Salt Creek and elsewhere. At Sussex production was found in Lakota sand at 7700 ft, and two producing areas have been established. Two producing areas have also been found in the Meadow Creek field, where production is from Shannon, Lakota, Frontier, and Tensleep.

Fields have also been discovered in the Glenrock area, Mush Creek, Fiddler Creek, Sage Spring Creek, South Cole Creek, and Ash Creek. In the Glenrock–South Glenrock fields eighty-one wells are producing from the Dakota zone. A number of fields in the Mush Creek–Fiddler Creek area are producing from Newcastle (Dakota) sands from 3000 to 6000 ft. The South Cole Creek field was discovered in 1948, and production is being developed from Dakota and Lakota sands. The Ash Creek discovery was completed this year, and three additional producers have been completed.

A geological map of the Powder River Basin, Wyoming, is included. C. A. F.

270. Frontier formation, Southwest Powder River Basin, Wyoming. D. Towse. *Bull. Amer. Ass. Petrol. Geol.*, **36** (10), 1962–2010.—Recent deep drilling has made possible a detailed study of the Upper Cretaceous Frontier formation in the Southwest Powder River Basin of the U.S.A.

This formation is an important oil producing area in Wyoming, and through the correlation of the surface and subsurface occurrences, it has been divided into four members.

The Frontier formation shows regular variation in water salinity and sediment supply; the basal bentonite of this formation is correlated with the Clay Spur bentonite of the Black Hills, and the concretions in the First Wall Creek member are correlated with the Greenhorn limestone of the eastern Powder River Basin.

E. N. T.

271. Wyoming discovery flows 572 brl distillate daily. Anon. *Petrol. Engr*, July 1952, **24** (7), B100.—1 Stockham–Federal, Washakie County, Wyoming, on test flowed 572 b.d. of 45° distillate and 12,000,000 cu. ft/day gas from Phosphoria at 12,905 to 13,000 ft. The well has been completed for an estimated daily potential of 1385 brl distillate. C. A. F.

272. Frontier formation, Wyoming and adjacent areas. W. A. Cobban and J. B. Reeside, Jr. *Bull. Amer. Ass. Petrol. Geol.*, **36** (10), 1913–61.—The Frontier formation of southwestern Wyoming consists of approx 2000 ft of sandstones and silt-stones interbedded with softer units of shale and mudstone containing minor beds of sandstone, coal, bentonite, and porcellanite. The upper half of the formation consists of marine sandstones, siltstones, and shales. The lower half consists of non-marine sandstones, siltstones, mudstones, and water-laid volcanic rocks with some coals, carbonaceous shales, and limestones, and is probably of Cenomanian age.

The marine beds in the upper half of the formation are dated as of late Greenhorn (Turonian), early Carlile (Turonian), and early Niobrara (Coniacian) ages. The non-marine unit near the top of the formation is believed to be of late Carlile age (Turonian).

E. N. T.

273. Standard opens gas field in Sacramento Valley. Anon. *Petrol. Engr*, July 1952, **24** (7), B100.—Sims Community 1, near Freeport in the Sacramento Valley, California, on a preliminary test flowed 3,717,000 cu. ft. gas/day from 5873 to 5875 ft and 5778 to 5788 ft. Pays are sands, and total depth was 7000 ft. C. A. F.

274. Probable large lateral displacement on San Gabriel fault, Southern California. J. C. Crowell. *Bull. Amer. Ass. Petrol. Geol.*, **36** (10), 2026–35.—In this paper the author sets out the probability of strike-slip movements in the San Gabriel fault zone in Southern California.

Large right-lateral displacement is suggested by the presence of the Upper Miocene sedimentary breccia now found northeast of the fault. This breccia, containing blocks of gneiss almost exclusively, has been offset from its source by at least 6 miles, but probably by 15 miles or more northwest. The San Gabriel fault zone, which trends northwesterly sub-parallel with the San Andreas fault for about 90 miles, appears to have a post-late Miocene right-lateral displacement of 15 to 25 miles. Southwest of this nearly vertical fault, 6 miles northwest of Castaic, Los Angeles County, Upper Miocene coarse conglomerates grade southwest into finer sediments from their source across the fault on the northeast.

It thus seems clear that this was their source area and that the conglomerates have been displaced 15 to 25 miles relatively northwest.

For more complete evidence it may be necessary to wait until more wells have been drilled and more subsurface information is obtainable. E. N. T.

275. Two gas discoveries made in Peace River area. Anon. *Petrol. Engr*, Aug. 1952, **24** (9), B104.—Royalite Gordondale 2, approx 12 miles southeast of the Pouce Coupe gas field, on test of the Cadotte flowed 9,000,000 cu. ft/gas from 2842 to 2857 ft.

Rycroft 1, in the same area, on test of the Cadomin from 4170 to 4180 ft flowed gas at 3,220,000 cu. ft/day. C. A. F.

276. Alberta gas find reported. Anon. *Petrol. Engr*, Aug. 1952, **24** (9), B108.—Prado Chauvin 8–28, 30 miles south of the Lloydminster field, on test flowed gas at 6,000,000 cu. ft/day from 2122 ft in Lower Cretaceous and recovered 20 ft oil-cut mud. Three pays are indicated. C. A. F.

277. Canadian discovery made. Anon. *Petrol. Engr*, July 1952, **24** (7), B102.—St. Albertax 1, a few miles northwest of Edmonton, Alberta, on test flowed 1140 ft of clean 36° oil from basal Lower Cretaceous sand from 3801 to 3809½ ft. C. A. F.

278. Oil indications seen in Peace River area well. Anon. *Petrol. Engr*, Sept. 1952, **24** (10), B140.—Rycroft 1, in the Peace River area, Alberta, has found large gas flows and oil indications in 45 ft of Cadomin sand. The lower Nikanassin sand is being tested. C. A. F.

279. Socony tests indicate new oilfield discovery. Anon. *Petrol. Engr*, Aug. 1952, **24** (9), B108.—Midway 1, approx 15 miles southwest of the Fosterton field in southwestern Saskatchewan on a 90-min test flowed 21° oil at 288 b.d. from 3450 ft.

The Cantuar well, 6 miles southeast of Fosterton, recovered 1400 ft of 22·8° oil on a test of Cretaceous sand at 3231 to 3254 ft, and 1100 ft from a test of ?Jurassic at 3295 to 3305 ft. C. A. F.

280. Geological conditions of oil occurrence in Middle East fields. N. E. Baker and F. R. S. Henson. *Bull. Amer. Ass. Petrol. Geol.*, **36** (10), 1885–901.—The Middle East can be divided tectonically into three geological provinces, and stratigraphically it is made up of three sections, exclusive of the non-productive pre-Mesozoic and post-Miocene rocks. These petroliferous sections are: first, the Triassic to Lower Cretaceous in eastern Arabia, a prolific oil-producing limestone–dolomite deposition; secondly, the Middle Cretaceous to Oligocene of Northern Iraq, southwestern Iran, and southeastern Turkey, including the sand and shales from western shorelines in Bahrein, Kuwait, and Basrah; and thirdly, the rapidly alternating series of Miocene evaporties, limestones, and clastics in southwestern Iran and Iraq.

All the commercial oil so far discovered in the Middle East has occurred in anticlinal traps in the foreland shelf and the orogenic mountain belt; although the possibility of other types of accumulation has not been excluded. E. N. T.

Geophysics and Geochemical Prospecting

281. Magnetometer surveys in New Mexico area. J. L. Harper. *Petrol. Engr*, Aug. 1952, **24** (9), B14.—Parts of Guadaloupe, De Baca, and San Miguel counties in New Mexico have been surveyed by airborne magnetometer, and two ground magnetic surveys have been carried out. Highs found by the ground survey give a structural picture similar to that obtained by surface mapping, but the airborne and ground magnetic maps do not correspond.

The Hobbs pool in southeast New Mexico was discovered after a magnetic survey of the area.

Maps showing magnetic contours of the Hobbs field and other structures are included. C. A. F.

Drilling

282. New techniques await resumption of offshore drilling. A. Gibbon. *World Oil*, Nov. 1952, **135** (6), 166.—Two techniques are proposed for use in offshore locations; the use of a tripod for mounting drilling rigs, in waters up to 600 ft depth; and an under-water oil gathering system, which would facilitate the temporary storage of oil in a tank on the sea bottom, or at a lesser depth, where effects of surface waves would be much reduced. The use of buoyant supports is suggested, as these would greatly reduce the difficulties of transportation from site to site. The length of the tripod lines may be varied by the removal, or substitution, of intermediate sections. The method for underwater storage requires that the tank never be empty, the displacement of water by produced oil ensuring the required internal support. A. J. H.

283. Torque converters supply flexibility and economy. M. L. Cooper. *World Oil*, Nov. 1952, **135** (6), 154.—The torque converter is described as one of the largest single improvements in power rig design. It has the flexibility of steam, while retaining the advantages associated with power rigs. Several assemblies are considered and test data given graphically to substantiate the claims. The torque converter may extend the working range of the rig, and greatly reduces the shock loading put on the rig engine. In addition, the rotary transmission may be improved, with resultant decrease in pipe failures. The distribution of the power and converters determines the overall range of the rig. A. J. H.

284. Gas-drilled wells yield more oil. N. C. Wells. *World Oil*, Nov. 1952, **135** (6), 139.—The use of gas and air for drilling is finding wider application. The method is largely similar to that using conventional drilling fluids in that similar bits and surface equipment, except for such features as valves and gas compressors, are used. A double string of drill pipe has been developed for use with gas drilling equipment. The circulation is directed down the annulus and up the tubing; with equal pitches the two tool joints may be made up simultaneously.

Reference is made to several operations. In general, the method may be used for drilling in reduced pressure oil sands, gas sands, fractured oil sands, and for drilling hole through prominent lost circulation zones. A. J. H.

285. Improved magnetic tool speeds fishing technique. J. H. Kirby. *World Oil*, Nov. 1952, **135** (6), 135.—The idea of recovering "junk" by magnetic force has existed for some considerable time, but only recently, with the use of cobalt steel, has it been possible to design and construct a practical permanent magnet. This magnet may be run with a wash-over shoe, and it is possible thereby to release embedded junk by washing, and then to recover the metal. The tool is not meant for making hole, but the idea of running in just prior to diamond coring is recommended as an "insurance run." Operators are advised to employ personnel trained in the use of the magnetic type of fishing tool. A. J. H.

286. New techniques improve drill collar performance. S. C. Moore. *World Oil*, Oct. 1952, **135** (5), 220.—Drilling through salt formations of 1 to 3% salt content provided particularly adverse conditions, resulting in many drill collar failures. The controlling factors were examined (four tables), and it was found that operators who could maintain a drill collar joint for more than 6000 hr observed the following precautions: correct size of joint for the drill collar; limited rotary speed; correct formation of thread roots and the cold working of the latter; controlled torque; and the use of magnesium anodes or stress relief grooves. For the overall reduction of failures, regular inspection of the joints is recommended. A. J. H.

287. Gas drilling promises to cut costs. E. R. Bruno. *World Oil*, Oct. 1952, **135** (5), 207.—A report is given on the use of gas for the drilling of the longest yet claimed section of hole, 8021 ft, from a depth of 1510 to 9531 ft. The indications are of remarkable increase in drilling efficiency even over such limits; such as nine bits during 8½ days against forty-four bits in 24½ days in a comparable formation using conventional drilling mud.

For the prevention of plugging, the exclusion of liquid in the well is essential, and therefore the hole was drilled to 1510 ft using conventional mud, and the surface waters then cased off. Conventional bits were used when drilling with gas, and although certain modifications were made to these, no advantage was noticed with the latter, and in general, the effect of the expansion of gas through the ports appeared to be sufficient for cooling the bearings.

Some trouble was experienced in keeping the hole "straight," but this was expected from the particular formation. In conclusion, the method has much to commend it. A. J. H.

288. Improved rock bit lowers hard formation drilling cost. L. L. Payne. *World Oil*, Oct. 1952, **135** (5), 202.—Field data are given relating to the use of the type of bit. The bit may be called a "spot" bit, but depending on the local requirements, its use may be amply justified. A. J. H.

289. Crush-type bit speeds brittle formation drilling. E. G. Boice. *World Oil*, Oct. 1952, **135** (5), 190.—These bits belong to a new and very distinct group, and much emphasis is laid on their limits of application. They are of use only in formations of high compressive strength and of great brittleness.

The bearing mounting and layout of rollers are conventional; in place of teeth, however, are small part-spherical inserts of tungsten carbide. The practical results are excellent, but it rests with the local operator whether or not the round trips required to use the bit on suitable hard formations are justified. The high cost of the bit may be offset by its longer life. It is interesting to note that in the hard formations the rate of penetration is exceptionally high. A. J. H.

290. Hot wire tool locates lost circulation. R. A. Henderson. *World Oil*, Oct. 1952, **135** (5), 187.—Frequently, when lost circulation zones are noticed in drilling, it is incorrectly assumed that these exist at the well bottom, *i.e.*, in the region of the drilling. Sufficient cases may be reported to emphasize that this is not always so, and excessive cost has thereby been added to the cost of operations.

The hot wire tool has been developed for the location of a change in fluid velocity in the well, such changes occurring in the lost circulation area. The tool has a streamlined external appearance, and, as it does not need any external moving parts, the chances of clogging are much reduced. The tool operates on the principle of changes in heat losses from a heated wire, with change of the rate of flow past it, of the cooling fluid. The survey may be logged at the surface, and is therefore very convenient.

A. J. H.

Production

291. The delta-log, a differential temperature surveying method. R. B. Basham and C. W. Macune. *J. Petrol. Tech.*, May 1952, **4** (5), *AIMME Tech. Paper No.* 3317, 123–8.—The differential temperature log is obtained by using two resistance thermometers 6 ft apart vertically, and recording their temperature differences, thereby obtaining a record of the temperature gradient in the well. Temperature differences of 0·001° F can be detected. Logging speeds are in the range 50 to 100 f.p.m. generally. The sensitivity can be adjusted.

The technique has been used to detect water and gas leaks in casing, and the position of a gas-producing zone. Normally the temperature gradient will be positive, but if the lower thermometer enters a zone cooled locally by gas entry, a negative gradient relative to the reference line will be recorded. When the lower thermometer passes the cool part the upper thermometer will enter it, and there will be a sharp reversal of the gradient, thereby giving a characteristic form to the record.

A series of examples are discussed. It may be possible to apply the equipment to detect cement older than 72 hr; to detect permeable zones by the disturbance of the normal temperature gradient when fluid is pumped into the well; to detect points of lost circulation; and to log formations by correlation of temperature gradient profiles.

G. D. H.

292. Behaviour of dissolved oxygen in oilfield brine. G. G. Bernard and G. A. Marsh. *J. Petrol. Tech.*, May 1952, **4** (5), *AIMME Tech. Paper No.* 3318, 119–22.—Oxygen-containing brines are known to be corrosive, and it is commonly assumed that brines exposed to air soon become more or less saturated with dissolved oxygen. A portable dissolved oxygen meter has been developed for use with brines. It is a polarographic technique which gives a reading in 30 sec, and has an accuracy of ±5%. The accuracy is not disturbed by the presence of Fe (ic), and Fe (ous), S, Ca, or Mg ions.

The oxygen concentration at various points in three brine conditioning plants has been studied. In two cases corrosion tests on nipples were made after the dissolved oxygen determinations. At Delaware " A " and Madill the dissolved oxygen content of the effluent liquid was low, despite the absence of mechanical de-aeration. The oxygen concentration increased on forced aeration, but decreased rapidly on standing, even in the presence of air. The corrosion rates for these two fluids were reasonably low. At Delaware " B " the plant was started up after standing for several years, and the final treated brine had as much as 2·4 mgm of dissolved oxygen/litre. After " seeding " the Delaware " B " brine with the oxygen-free Delaware " A " brine, the dissolved oxygen content of the former had dropped to zero in a week. The disappearance of the oxygen is believed to be due to biochemical action.

It is concluded that mechanical de-aeration may not always be necessary to ensure low corrosion rates.

G. D. H.

293. Observations from profile logs of water injection wells. H. H. Kaveler and Z. Z. Hunter. *J. Petrol. Tech.*, May 1952, **4** (5), *AIMME Tech. Paper No.* 3319, 129–34.—It has frequently been observed that the horizontal permeability of oil reservoir rocks varies vertically. Nine wells in the North Burbank field of Oklahoma were diamond-bit cored through the Bartlesville sand, and core analyses were made,

including horizontal permeability measurements. Water injection profiles were measured with a flow device, and these profiles were compared with the permeability profiles. Generally the water entered the sand most freely at points which did not correspond with the zones of maximum horizontal core permeability. In one case the core from the point of easiest entry had horizontal permeabilities of less than 1 mD, but the core showed evidence of vertical fracturing.

It is believed that the vertical permeability component appreciably affects the behaviour of the rocks, and, moreover, three plugs across a diameter of one core showed a 300% variation in horizontal permeability between adjacent samples. Flow paths are thought to be complex, and some techniques in production practice require reconsideration. Not all operations based on core permeability profiles may be satisfactory. Thus, by-passing may differ from the common concept, and pressure maintenance may not be so good as planned. G. D. H.

294. Prediction of saturation pressures for condensate-gas and volatile-oil mixtures. E. J. Organick and B. H. Golding. *J. Petrol. Tech.*, May 1952, **4** (5), *AIMEE Tech. Paper No.* 3320, 135–48.—All available experimental dew-point and bubble-point data for complex hydrocarbon mixtures were assembled and used for calculating B (sum of the products of the mol fractions and the boiling points of the individual components), and W_m (modified weight average equivalent molecular weight). Saturation pressure was related directly to the composition of the mixture by means of these two generalized composition characteristics. These two parameters were calculated in a simple and reproducible manner from the stream analyses of the mixture and the ASTM distillation for the heavy ends. The need for hydrocarbon equilibrium constants was eliminated.

Fourteen working charts show the correlation in which saturation pressures and either retrograde dew points or bubble points are plotted against temperature for mixtures having discrete values of the parameters B and W_m.

Comparison between experimental and predicted saturation pressures shows that the probable error for 214 points was 5%; that for high G.O.R. condensate fluids (40,000 cu. ft/brl or more) the probable error is about 8%. In each case probable error is comparable with the overall uncertainty of the data from which the correlation is derived.

The solution of a typical problem is given. G. D. H.

295. Water flood evaluations aided by electric logs. M. Cook. *World Oil*, Nov. 1952, **135** (6), 206.—By the careful correlation of known physical factors of a reservoir with electric logs run in the formation, it is possible to develop the secondary recovery programme. First, attention must be paid to the continuity of the sand bodies and the relationship between wells used as producers–injection wells, and to the sand bodies. The logs may also be used for the estimation of porosities and permeabilities, and the location of thief zones. In general, it is recommended that, for connate water saturation in excess of 30 to 35%, the initiation of a water flood project should receive particularly careful consideration. In every case past history is of great assistance in assessing a system's worth. A. J. H.

296. Air injection revives depleted Kansas field. W. M. Edinger. *World Oil*, Nov. 1952, **135** (6), 196.—The further development of accepted secondary recovery methods has been continued to a system where air–gas may be injected into a lenticular reservoir, and oil produced from the same well by the gas lift principle. The air is injected into the already existing gas cap. Although not yet definitely proved, the method has high possibilities; it is suited to shallow reservoirs where only low production costs are permissible. A. J. H.

297. Mechanical aspects of corrosion inhibitor injection. D. J. Elliott. *World Oil*, Nov. 1952, **135** (6), 190.—Corrosion of equipment has always been a major field problem, and with the restriction put on raw materials, the more suitable remedy is the prevention of corrosion by inhibitors. Although satisfactory, stick inhibitor "lubrication" is not very efficient. Described methods use a liquid inhibitor which may be injected into the well.

In the case of wells which may be closed in, the inhibitor is injected into the tubing, and time allowed for its dispersion. When closing in a well is undesirable, the inhibitor is injected into the base of the tubing through the annular space; the method utilizes back pressure valves set in the tubing.

For gas lift installations, the continuous injection of the inhibitor presents no problem. A. J. H.

298. How to determine gas well interference graphically. D. Cornell. *World Oil*, Nov. 1952, **135** (6), 187.—The graphical solution is based on the use of a partial differential equation inter-relating the reservoir constants. Two tables. References. A. J. H.

299. Hydraulically pumping dual completions. T. E. Horton. *World Oil*, Oct. 1952, **135** (5), 274.—Dual completions, originally for the saving of steel, have posed some operating problems. In this method raising or lowering the tubing by about 18 inches enables the production to be taken from either the upper or from the lower zone. The hydraulic pumping side is conventional. The method is still on test. A. J. H.

300. Gas wells from depleted oil wells. H. E. Little. *World Oil*, Oct. 1952, **135** (5), 262.—The recent increase in demand for gas has concentrated attention on once-depleted wells. By the combination of γ-ray and neutron logs, the position of productive zones may be estimated. A run of selective perforations is then made, where the casing is perforated at a density of one shot per foot. By noting the productive capacities of the zones at the surface the more suitable one may be selected. The method has the advantage of economy. A. J. H.

301. Acid gel fracturing increases production. R. S. Ousterhout and D. E. Ramsey. *World Oil*, Oct. 1952, **135** (5), 257.—The normal acid treatment is ineffective if the soluble material consolidating the sand is protected by an insoluble layer. This method uses an acid gel with sand particles in suspension, and consists in fracturing the formation, or extending the natural fractures, and maintaining the fractures with the use of sand grains (40 mesh). The normal solution treatment may then be carried out.

The method has been proved particularly effective for the Grayburg formation, for which data are given. It is economical. A. J. H.

302. Saving 2800 feet of casing per well. J. E. Kastrop. *World Oil*, Oct. 1952, **135** (5), 243.—Normal drilling procedure is carried out to a depth of about 3000 ft, where 8⅝-inch casing is set to seal off a salt formation. Drilling is then continued with a 7⅞-inch bit and a water mud. Just above the Clearfork formation, the mud is changed to an oil emulsion type, and the formation penetrated. The formation is then temporarily sealed off, and the 5½-inch casing set after cleaning operations. The casing above about 2800 ft is "backed off" using a special tool, and the hole tested in the routine way. The hole is then cleared to bottom, and the well is ready for production.

Further completion methods are described. A. J. H.

303. French petroleum industry in 1952—Exploration and production. Anon. *Rev. Pétrolière*, Dec. 1952 (51), 26–7.—Extracts from a report compiled under the auspices of the Union of Chambers of Commerce of the petroleum industry. Details are given of oil and natural gas production in France and of exploration in the French colonial empire. E. H.

304. Metalliferous substances adsorbed at crude petroleum–water interfaces. C. G. Dodd, J. W. Moore, and M. O. Denekas. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2585–90.—Film-forming and surface active constituents in crude petroleum affect the flow of fluids in petroleum reservoirs and the analysis of reservoir rock core samples. The discovery of metallic elements in these substances has stimulated a study of the interfacially active materials with respect to the role of the metals. Compounds

of zinc, copper, nickel, titanium, calcium, and magnesium were found to be adsorbed selectively at the petroleum–water interfaces, vanadium was adsorbed to a minor extent, and iron to an intermediate degree. The results indicate that all eight elements occur in petroleum in oil-soluble forms, possibly as porphyrin–metal chelate complexes or other complexes with nitrogen-containing compounds. Although inconclusive, the results support the assumption that film-forming and surface active constituents of petroleum result from biochemical diagenesis of organic matter in sediments. These films may consist of waxes and resins with stabilizing porphyrin metal complexes. Free porphyrins, porphyrin ring oxidation products, and protein–metal salts or complexes also may be present. (Author's Abstract.) E. J. C.

305. Patents. U.S.P. 2,592,547 (15.9.47; 15.4.52). F. E. Dunn, assr to A. D. Cook Inc. Deep well pump.

U.S.P. 2,593,057 (29.12.49; 15.4.52). M. G. Savoy, assr to The Pure Oil Co. Protecting steel surfaces in oil wells against H_2S and brine corrosion by adding a small amount of cellulose sulphate or an alkali metal salt of carboxymethyl cellulose to the oil–brine mixture being withdrawn from the well.

U.S.P. 2,593,497 (26.5.47; 22.4.52). R. Spearow. Producing oil wells. R. C. R.

Oilfield Development

306. Veteran field fills big role. R. M. Churchwell. *Petrol. Engr*, Sept. 1952, **24** (10), B11.—The development of the Lance Creek field in the Powder River Basin, Wyoming, since its discovery in 1918 is described. Cumulative production to date from the field, which has been the second largest producer in the basin, is approx 78 million brl. The field has also provided important reservoir data which has facilitated the evaluation of production methods of other fields in the area. Twelve pays have been found, of which unitized parts of the First Sundance, Basal Sundance, Converse, and Leo zones have produced the bulk of the cumulative production to Jan. 1952.

A structural map and aerial photographs of the field are included. C. A. F.

Transport and Storage

307. How to compute tank sizes for products terminals. R. B. Rodgers and S. Hallberg. *World Oil*, Nov. 1952, **135** (6), 257. (*Paper presented at Products Pipe Line Conference, API Divn of Transportation, Fort Worth, 12 Apr.* 1952.)—A method for the estimation of tank requirements based on a five-year forecast of estimated future demands. The required data and use of formulæ and graphs are given. A. J. H.

308. The El Paso story. C. L. Perkins. *World Oil*, Nov. 1952, **135** (6), 239.—A description of the extent to which the El Paso Natural Gas Company has expanded its operations. Over 6000 miles of pipe have been laid across extreme forms of terrain. Photographs. A. J. H.

309. Automatic weighing of crude oil proves accurate volume gauge. L. E. Slagle and D. C. Meyers. *World Oil*, Oct. 1952, **135** (5), 246.—The "weigh-o-matic fluid meter" has been proved in field use, and has the advantage of not being affected by fluctuations in temperature, or by paraffin accumulation. The method depends upon the accurate weighing of crude per cycle. For the estimation of volume, samples are taken per cycle, for overall analysis at a more convenient time. Safety measures are incorporated; the hydraulic operation of valves, etc., may be replaced by electric operation if more convenient. A high accuracy is claimed. The "flow system" is described. A. J. H.

310. Asphalt-carrying tankers. Anon. *Mot. Ship*, 1952, **33**, 360.—Two tankers specially constructed for carriage of asphalt in bulk have been ordered in France. Of one, *Esso le Caroubier*, an illustrated description is given, including details of the cargo tanks and main and auxiliary machinery. U. M.

311. The 8,450-ton tanker "Burmah Emerald." Anon. *Mot. Ship*, Dec. 1952, **33** (393), 348.—A full description, with illustrations and arrangement plans, is given of the *Burmah Emerald*, the first of two sister ships to be built for Burmah Oil Co. (Tankers) Ltd. The ship, of 8450 tons d.w.c. on draught of 25 ft, has been primarily designed to carry small parcels of white oil to small coastal ports in India, Pakistan, and Burma and for navigating rivers Hooghly and Caragoola at Chittagong. About twelve different grades of fuel can be carried, small consignments, such as special aviation spirits, being loaded in summer tanks. A Sulzer two-stroke five-cyl engine of 720 mm bore and 1250 mm stroke, developing 3500 b.h.p. at 125 r.p.m., is installed, burning boiler oil of viscosity up to 3000 sec R.I. at 100° F. U. M.

312. Socony-Vacuum reconditions line over ditch without interrupting service. J. A. Rupe. *Oil Gas J.*, 24.11.52, **51** (29), 112.—Leak repairing, reconditioning, and coating of the 175 miles of 6-inch products line in Kansas is described. G. A. C.

313. The Story of Platte Pipeline. K. T. Feldman *et al.* *Oil Gas J.*, 1.12.52, **51** (30), 87.—Unusual design features, design and construction of pump stations, design details, electrical features, and communications are described. G. A. C.

314. Radioactive tracers to mark interfaces and measure intermixing in pipelines. D. E. Hull and J. W. Kent. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2745–50.—Radioactive compounds of barium 140 and antimony 124 have been found suitable in oil-soluble form for tracing the interfaces and mixing of different petroleum products in the same pipeline. Practical experience on pipelines is reported, and it is claimed that the method permits rapid identification of interfaces and extent of contamination without the need for sampling. E. J. C.

315. Patents. U.S.P. 2,592,744 (30.3.49; 15.4.52). C. J. Ryant, assr to Standard Oil Co. Electrical liquid level indicator.

U.S.P. 2,593,172 (21.2.49; 15.4.52). A. Neumann. Liquid level gauge for oil drums.

U.S.P. 2,593,473 (6.2.48; 22.4.52). J. R. McKnight. Electrically operated liquid level indicator.

U.S.P. 2,593,830 (21.2.48; 22.4.52). H. E. Baker. Liquid sampling instrument for determining the level in a tank of a bottom liquid having a higher sp. gr. than the main body of liquid therein.

U.S.P. 2,594,512 (6.5.49; 29.4.52). A. E. Steele, assr to Air Products Inc. Pumping system for a highly volatile liquid. R. C. R.

U.S.P. 2,598,160 (France 4.11.43; 27.5.52). A. Gruenais. Large capacity cylindrical tank with a vertical axis, the top and bottom end surfaces being corrugated around the central axis, with vertical stays opposite the concave surfaces of the corrugations.

U.S.P. 2,598,170 (11.3.46; 27.5.52). E. E. Huebotter, assr to National Lead Co. Leakage of salt water contained in steel tanks is prevented by adding gelatinized starch, gum, or sea-weed which forms a gel therein.

U.S.P. 2,597,576 (3.12.48; 20.5.52). T. F. Donovan, assr to Air Associates Inc. A closure for pressurized fuel tanks has a reciprocatory plunger provided with leaf springs at its inner end and adapted to be rotated with the closure to impinge the end of the springs against an annular closure in closed relation with the tank, the plunger being connected to a hand lever for tensioning the leaf springs against the rim by movement thereof to past dead centre position, thereby sealing the vent passageway through the plunger and tensioning the closure against the air pressure within the tank.

U.S.P. 2,597,976 (11.10.49; 27.5.52). E. Cousins, assr to Wingfoot Corpn. A gasket resistant to the swelling and solvent action of liq hydrocarbon fuel, which retains its flexibility and sealing properties at from −70° to 200° F, comprises an endless body of vulcanized rubber (natural rubber or mixture with an equal amount of polybutadiene or a butadiene–styrene (100–75 : 0–25%) copolymer) covered with a hydrocarbon resistant film-forming material (nylon, polyalkylene polysulphides,

poly-$C_2H_3F_4$, poly-$C_2H_2F_3Cl$, poly-$CH_2:CHOH$, methyl cellulose, or mixture of nylon with a butadiene–acrylonitrile (100–55 : 0–45%) copolymer.

U.S.P. 2,598,022 (10.5.46; 27.5.52). T. G. Smith, assr to Wingfoot Corpn. A hose comprises a flexible tubular portion and a cover therefore comprising weft and warp cords, alternate warp cords being of different diameters to increase flexibility.

U.S.P. 2,597,975 (Italy 28.4.44; 27.5.52). R. Colombo. Manufacture of thermoplastic hose having a helical reinforcement rib of a different thermoplastic material, by extruding a two-layer thermoplastic hose, cutting a helical slit in the outer layer as it issues from the die, and then stretching the hose. V. P. P.

Refinery Operations

Refineries and Auxiliary Refinery Plant

316. Process section. Anon. *Petrol. Refin.*, Sept. 1952, **31** (9), 97–238.—A complete handbook of refinery processes is presented, giving flow diagrams, description of processes and details of charge stocks, yields, and commercial installations in operation.

Processes described include catalytic cracking and reforming, thermal conversion, light hydrocarbon recovery, gas conversion, oil distillation, solvent refining, treating, and petrochemical processes. A. R. H.

317. Effect of pulsations on heat transfer ; turbulent flow of water inside tubes. F. B. West and A. T. Taylor. *Chem. Engng Progr.*, Jan. 1952, **48** (1), 39–43.—Water film coefficients of heat transfer inside tubes for heating and cooling at Reynolds numbers of 30,000 to 85,000 have been increased as much as 60 to 70% by the use of partially dampened pulsating flow from a reciprocating pump. An optimum degree of dampening appears to exist, above which pulsations were less efficient, resulting in more vibration than moderate pulsations.

Power consumption measurements indicate an increase of not more than 30% in net power consumption; the method and equipment used, which is described in some detail, appears to have applications both to new design and to increasing the capacity of existing heat exchangers. J. G. H.

318. Mass-transfer rates on bubble plates. J. A. Gerster, W. E. Bonnet, and I. Hess. *Chem. Engng Progr.*, Oct. 1951, **47** (10), 523–7; Dec. 1951, **47** (12), 621–7.—A quantitative study of the effect of the major bubble plate design and operating variables on gas film and liquid film plate efficiency. Gas and liquid effs are shown to be related to foam height and foam density on the operating tray, since each of these affects interfacial area and time of contact for the mass transfer operations. Correlations for foam height and foam density are presented, permitting prediction of the effect of changes in gas and liquid rate, liquid depth, and length of liquid travel upon plate performance. In most cases such predictions agreed with experimental gas and liquid eff results presented for a large and a small tray. The gas and liquid effs of this study, suitably correlated for changes in physical properties, were combined for prediction of plate effs for the methanol–water system at 1 atm and at 4 atm total pressure and over the complete concentration range. These predicted values agreed well with new experimental values presented in this paper. J. G. H.

319. Applications of fluid mechanics and similitude to scale-up problems. J. H. Rushton. *Chem. Engng Progr.*, Jan. 1952, **48** (1), 33–8; Feb. **48** (2), 95–102.—The principles of dynamic similitude are briefly reviewed, and the use of fluid mechanics to develop relations between fluid motion, equipment size, and fluid properties as applied to chemical engineering is demonstrated, and a general method is presented for the determination of the requirements for dynamic similitude for any flowing system. Applications of these principles to the obtaining of scaling-up data for operations involving resistance to fluid flow, discharge of liquids from tanks, blending of liquids by a mixer, control of forced vortexes, dissolving of solids during mixing, and absorption and desorption of gases in moving liquids are indicated, and suggestions made for applying the principles to any type of operation involving mass transfer in a liquid, and to such other flow operations as fluidized systems and suspensions. J. G. H.

320. Procedure for scaling-up a catalytic reactor. J. Beek and E. Singer. *Chem. Engng Progr.*, Oct. 1951, **47** (10), 534–40.—The treatment of laboratory data for the preparation of working charts for the designer of the pilot plant is demonstrated, together with an indication of the means whereby experience obtained in the operation of pilot plant is applied in developing the final design. The example used is the production of toluene by the dehydrogenation of methyl*cyclo*hexane. A mixture of hydrocarbons and recycle hydrogen preheated to 860° F is passed through tubes containing catalyst pellets. The tubes are heated on the outside by flue gas at 1200° F. Variables considered were : tube size, ratio of hydrogen to hydrocarbons, and toluene in the feed. Final working charts are in terms of volumetric production rate *vs* conversion for various tube sizes, recycle ratios, and feed compositions, and tube lengths *vs* space velocity for various pressure drops. J. G. H.

321. Heat transfer between a vertical tube and a fluidized air–solid mixture. W. M. Dow and M. Jakob. *Chem. Engng Progr.*, Dec. 1951, **47** (12), 637–48.—Heat transfer from a vertical tube wall to fluidized beds of small solid particles was investigated experimentally in 2- and 3-inch dia tubes, with a fluidized mixture of particles of aerocat, pitch coke, and iron, suspended in an upward-flowing stream of air entering at average velocities of ½ to 1 f.p.s. A heat transfer mechanism was deduced involving a narrow thermal layer next to the tube wall, a limited thermal mixing region at the bottom of the fluidized bed, and a large thermal equilibrium region throughout the remainder of the bed. From this was developed a dimensionless correlation of the experimental data for mechanically smooth, dense-phase fluidization, involving the following variables : mean heat-transfer coefficient, tube diameter, particle diameter, fluidized bed height, air velocity and physical properties, and specific heat and density of the solid particles. The rate of heat transfer was found to be markedly affected by conditions of slugging and channelling. J. G. H.

322. Generalized graphical method for the design of fixed bed catalytic reactors. T. Baron. *Chem. Engng Progr.*, Mar. 1952, **48** (3), 118–24.—A graphical method, based on a consideration of the lateral heat and mass transfer occurring in a bed, is developed for the design of fixed bed catalytic reactors, and equations are derived for the effective lateral diffusivity of heat and mass. The theory and published data both indicate that, provided catalyst pellets have low thermal conductivity, the effective diffusivity for mass transfer is numerically equal to the effective diffusivity for heat transfer. These, with associated results, facilitate the presentation of a simple graphical design which yields the distribution of temp and fractional conversion. J. G. H.

323. Heat transfer ; Processing viscous materials. E. Perry and F. E. Reese. *Chem. Engng Progr.*, July 1951, **47** (7), 354–62.—The significance of heat transfer in the process industries is remarked, and the complicated nature of the theoretical approach to heat transfer in high polymers is noted with its effects on equipment design and process development.

A series of case histories illustrating the methods by which satisfactory heat transfer is obtained in the processing of high polymers are presented, and it is indicated how, through a careful study of the chemical and physical characteristics of a material, the correct processing approach from a heat-transfer viewpoint can be selected for most viscous materials. J. G. H.

324. Thermal insulation for industrial requirements. Pt VII. R. Thomas. *Petrol. Refin.*, **31** (10), 115–21.—The specifications and applications of low temperature insulation are discussed, with particular reference to vapour barriers. A. R. H.

325. Analyse cooling tower performance by this method. D. R. Baker and L. T. Mart. *Petrol. Refin.*, 1952, **31** (10), 97–105. (*Amer. Soc. Mech. Engrs, Cincinnati, June* 1952.)—A new concept makes it possible to predict performance ratings of proposed towers while still in the design stage. The method is based on the concept of a unit volume coefficient f, which is defined by $f = \frac{Ka}{G}$, where K is the overall average unit energy transfer conductance per sq. ft. of water surface area in the tower

based upon an enthalpy difference potential, (B.T.U.)/(hr)(sq. ft.)/(BT.U/lb. enthalpy difference), a is the area per unit volume, and G the gas rate in lb/(hr)(sq. ft.). Worked examples, showing the application of the method, are given. A. R. H.

326. Fans and blowers. M. Van Winkle. *Oil Gas J.*, 24.11.52, **51** (29), 133.—No. 31 in this series gives Pt 12 on this equipment, and deals with the use of fan laws; examples and solutions being provided. G. A. C.

327. Heat transfer. B. E. Lauer. *Oil Gas J.*, 24.11.52, **51** (29), 143; 1.12.52, **51** (30), 155; 8.12.52, **51** (31), 133.—Pt 13 of this series continues with coefficients of heat transfers through film between inside surface of cool tube and warm liquid.

Pt 14 continues with coefficients of heat transfer through film between inside surface of cool tube and warm liquid.

Pt 15 continues with coefficients of heat transfers through film between inside surface of cool tube and condensing vapour. G. A. C.

328. Centrifugal pump calculations. B. J. Lerner and A. J. Barduhn. *Oil Gas J.*, 1.12.52, **51** (30), 145; 8.12.52, **51** (31), 123.—No. 32 of the Engineering Reference Section deals with making an energy balance in centrifugal pump calculations. A formula is provided based on a typical pump layout.

No. 33 of the Engineering Reference Section discusses "suction head" and "discharge head," figures and formulæ illustrate suction and discharge line quantities. G. A. C.

329. Modern hydraulic pumps and motors. J. R. Fawcett. *Mech. World*, Dec. 1952, **132** (3401), 246.—Most modern oil pumps are suitable for high speed operation, and can be coupled direct to motor or engine. Piston pumps are most efficient, and efficiencies of 95% have been attained. Pumps with mechanically operated valves will normally function as motors when supplied with oil under pressure. Pump and motor units have overall efficiencies of approx 80%, and can be arranged to give variable speed output with either constant max torque or constant max h.p. A variable delivery piston pump and a cam pump are described. T. T.

330. Design of bubble cap distillation columns. D. C. Freshwater. *Industr. Chem. Mfr*, 1952, **28**, 538–44.—Plate eff of 75% is commonly assumed in designing dist columns; however, for binary mixtures plate eff may vary from plate to plate in same column, while for multi-component mixtures different effs may be obtained on same plate with respect to different components. Many empirical relationships therefore necessary in column design work. In calculating column dia from superficial vapour velocity, up to 10% entrainment is permissible without affecting plate eff, but dia is better calculated from vapour velocity through bubble cap slots, assuming slot area is 10% of free column area and all caps pass equal amounts of vapour. Equation used for this is $U_s \sqrt{\rho_v} = K$, where U_s = slot velocity f.p.s., ρ_v = vap density lb/cu. ft., and $K = 12$. Min plate spacing for given column dia shown in empirical table (column dia 0 to 2 ft, plate spacing 6 inches; 2 to 4 ft, 12 inches; 4 to 6 ft, 18 inches; $>$ 6 ft, 24 inches). Pressure drop across column affected by weir height on bubble trays, which controls static submergence. In addition, weir length must be calculated to give desired liquid head over weir for given load. On inlet side of plate (for cross flow columns), cap submergence is further increased by hydraulic gradient necessary to cause liquid flow across plate. Column dia should be such as to give hydraulic gradient of $\frac{1}{2}$ inch max. Normal riser area is 10% of column area, and normal pressure drop per plate is 2 to 4 inches equivalent head of liquid for atmospheric columns, and $<$ 1 inch for vacuum columns. Twenty-six references. A. C.

331. Materials of construction. Anon. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2289–380.—Annual review of materials of construction under the following headings: aluminium alloys, cements, ceramics, elastomers, fibres, nickel and nickel-base alloys, plastics, hard rubber, stainless steels and other ferrous alloys, tin and its alloys, and less common metals. Tables are also supplied giving the properties of synthetic fibres and the less common metals. E. J. C.

332. Mixing of liquids in chemical processing. J. H. Rushton. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2931–6.—Reviews recent progress in the field of mixing, with particular emphasis on fluid motion, characteristics of rotating equipment, and machinery available. The importance of dynamic similarity and scaling-up from bench or pilot plant data are also discussed. E. J. C.

333. Jetties built at the Rotterdam (Pernis) refinery of The Royal Dutch Shell Group. J. P. A. van Lookeren Campagne. *Ingenieur,'s Grav.*, 5.12.52, **64** (49), A573–4.—Flexible steel dolphins protect the jetties for sea-going vessels. Those for inland tankers up to 3000 tons are reinforced concrete structures, flexible by themselves and protected by wooden fenders. The jetties for merchandise and packed goods are of a rigid construction, protected by tubular rubber fenders. Photographs and constructional details are included. G. F. T. C.

334. Patents. U.S.P. 2,592,530 (24.5.45; 15.4.52). N. C. Artsay, assr to Foster Wheeler Corpn. Steam separator including means for separating entrained steam by the centrifugal force of the rotary motion imparted to the water containing the entrained steam.

U.S.P. 2,592,608 (1.12.45; 15.4.52). T. H. Sherman, assr to Foster Wheeler Corpn. Furnace for heating liquids.

U.S.P. 2,592,709 (25.2.50; 15.4.52). W. R. Kinnaird, assr to Universal Oil Products Co. Liquid mixing and homogenizing apparatus.

U.S.P. 2,592,848 (30.9.48; 15.4.52). P. Baird, assr to Cee-Kleer Products Inc. Sight glass fitting for piping systems containing circulating liquids.

U.S.P. 2,593,404 (31.12.47; 22.4.52). J. W. Barker, assr to Houdry Process Corpn. Means for transferring solid contact material between contact zones in a hydrocarbon conversion system whilst maintaining a substantial gas seal.

U.S.P. 2,593,425 (14.3.47; 22.4.52). J. E. Evans, assr to Houdry Process Corpn. Classifying system for pieces of solid material of unequal size.

U.S.P. 2,593,495 (1.11.46; 22.4.52). H. G. Shimp, assr to Houdry Process Corpn. Apparatus for applying an atomized hydrocarbon to contact material during its passage through the reaction zone.

U.S.P. 2,593,548 (16.1.48; 22.4.52). W. R. Edwards, assr to Celanese Corpn of America. Gas scrubbing apparatus.

U.S.P. 2,593,718 (1.10.49; 22.4.52). J. Beam, assr to Universal Oil Products Co. Centrifugal apparatus for recovering finely divided particles.

U.S.P. 2,593,707 (3.8.48; 22.4.52). T. B. Walker, assr to I. Braithwaite & Son Engineers Ltd. Filter.

U.S.P. 2,594,329–30 (6.5.47; 29.4.52). R. L. Mayhew, assr to Hydrocarbon Research Inc. Gas generator for carbon monoxide production.

U.S.P. 2,594,471 (11.10.46; 29.4.52). L. J. Marshall, assr to Combustion Engineering-Superheater Inc. Heat exchanger for high temperature gases.

U.S.P. 2,594,518 (28.6.47; 29.4.52). H. A. Teale, assr to G. B. Finnegan. Filter press plate.

U.S.P. 2,594,675 (28.3.49; 29.4.52). K. T. Norell, assrs to AB. Bofors. Apparatus for contacting two immiscible liquids of difference density.

U.S.P. 2,594,762 (26.12.45; 29.4.52). R. R. Freund and W. H. Creel, assrs to Phillips Petroleum Co. Distribution system for hot fluids. R. C. R.

U.S.P. 2,596,616 (9.4.51; 13.5.52). G. J. Strezynski, assr to De Laval Separator Co. A mixture of solids and a liq of lower sp. gr. is fed to a coarse centrifuge which forms an outer annulus *A* of coarse solids and an inner annulus *B* of liq + fine solids. The coarse solids are passed inwardly through *B* and then further inwards against centrifugal force, *e.g.*, by means of a helical scraper, to the outlet. Effluent from *B* is discharged separately and concentrated in a fine centrifuge, the concentrate being returned to the coarse centrifuge at a point removed from *A* and *B*. The liq in the concentrate is passed out to *B* in countercurrent to the coarse solids, and is ultimately

discharged with the effluent from *B*. The fine solids from the concentrate mix with and accompany the coarse solids moving inwards, thereby facilitating their discharge.

U.S.P. 2,596,601 (31.7.47; 13.5.52). H. L. Richardson, assr to Research Corpn. Apparatus for separating dust from a gas stream by means of a foam blanket.

U.S.P. 2,596,575 (22.10.49; 13.5.52). M. W. MacAfee, assr to Dorr Co. Apparatus for clarifying water bearing crude petroleum field oil which applies: (*a*) within the layer of gunk, gentle forward and lateral, or deflective forces for contacting or coalescing oil particles to form droplets that rise into the oil stratum; (*b*) gentle forward and lateral pushing-aside forces in the lower viscous oil-containing portion of the oil stratum, reflecting forces being applied to the so displaced oil so that resulting contacting of water globules results in production of water droplets which sink into the gunk stratum. (Gunk is a stable emulsion of oil, wax, tar, clay, and salt water which accumulates between the lighter oil and heavier water layer in an oilfield wash tank.)

V. P. P.

Distillation

335. An algebraic solution of the McCabe-Thiele diagram. M. R. Beychok. *Chem. Engng Progr.*, May 1951, **47** (5), 265–9.—An algebraic solution of the McCabe–Thiele method of calculating the efficiency of fractionating tower trays is presented which lends itself to repetitive "form sheet" calculations and avoids diagram drafting errors. The method was primarily and specifically derived for use in experimental studies involving a great number of efficiency calculations. J. G. H.

336. Extractive distillation; design and application. J. M. Chambers. *Chem. Engng Progr.*, Nov. 1951, **47** (11), 555–65.—The extractive distillation column with two sections where the extractant flows from one extremity to the other, flowing countercurrent to the first key in one section and concurrent with the second key in the other section, is considered. The volatility of the extractant may be less than, greater than, or between, the volatilities of the keys. It may azeotrope with one or both; the only practical restriction is that any azeotrope formed can be easily broken or is a product itself.

Basic fundamentals are considered in some detail, and three examples based on the ternary methanol–ethanol–water system are presented. J. G. H.

337. Fluid flow through packed columns. S. Ergun. *Chem. Engng Progr.*, Feb. 1952, **48** (2), 89–94.—Existing data on fluid flow through beds of granular solids are critically reviewed. Pressure losses are found to be due to simultaneous kinetic and viscous energy losses, and a comprehensive equation applicable to all types of flow is developed. This is examined from the point of view of its dependence upon flow rate, properties of the fluids, fractional void volume, orientation, size, shape, and surface of the granular solids. A new concept of friction factor, representing the ratio of pressure drop to the viscous energy term, is discussed, and experimental results obtained for the purpose of testing the validity of the equation are reported.

J. G. H.

338. Limiting flow and holdup in a spray extraction column. G. W. Minard and A. I. Johnson. *Chem. Engng Progr.*, Feb. 1952, **48** (2), 62–74.—A study of limiting flow and hold-up carried out in a 4-inch i.d. by 8 ft spray tower of Elgin design. Two theoretical relationships between hold-up and phase rates of limiting flow are proposed which indicate useful methods of representing data, but require values of static velocity and more accurate measurements of hold-up for further testing. An empirical correlation for limiting flow, based on an extension of Bertetti's theory, is proposed, which may be used to estimate spray tower operation for a second system, once the "nozzle constant" has been determined for one system, and eliminates the necessity for knowing drop size and hold-up. Limitations in the Elgin spray-tower design and the Elgin correlations are pointed out, and the need for further work is indicated.

J. G. H.

339. Applied distillation, Pt II. K. E. Coulter. *Petrol. Refin.*, **31** (10), 145–50.—(See Abs. No. 3127—1952.) An elementary discussion of the principles involved in the design and operation of packed and bubble cap columns is presented. A. R. H.

340. Composition of vapours from boiling binary solutions. D. F. Othmer, S. J. Silvis, and A. Spiel. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1864–72.—A recirculating type of pressure equilibrium still is described. This was used to determine equilibrium data for acetic acid–water up to 515 p.s.i.a. E. J. C.

341. Composition of vapours from boiling binary solutions. D. F. Othmer, M. M. Chudgar, and S. L. Levy. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1872–81.—Vapour–liquid equilibrium data are reported for binary and ternary systems of methyl ethyl ketone, acetone, and water at pressures up to 500 p.s.i.a. E. J. C.

342. Studies in high vacuum evaporation. (*a*) **The falling-stream tensimeter.** K. C. D. Hickman and D. J. Trevoy. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1882–8. (*b*) **Projective and equilibrium vapour–liquid relationships for two binary systems over an extended range.** D. J. Trevoy. *Ibid.*, 1888–92. (*c*) **Surface behaviour in the pot still.** K. C. D. Hickman. *Ibid.*, 1892–902. (*d*) **Comparison of high vacuum stills and tensimeters.** K. C. D. Hickman and D. J. Trevoy. *Ibid.*, 1903–11.—First paper reviews art of very high vacuum distillation and describes a new type of still (falling-stream tensimeter) for investigating evaporation coefficients at very low pressures. Using 2-ethyl hexyl phthalate (EHP) and 2-ethyl hexyl sebacate (EHS), it was found that their rates of distillation agree exactly with calculation below 5μ, but fall off slightly at higher pressures.

The above work was extended to investigate the variation of relative volatility with temperature noted in the initial experiments, and to the system di-*n*-octyl phthalate–EHS, which has been suggested as being suitable for evaluating molecular stills. The results are reported in the second paper.

The third paper is a study of surface characteristics of liquids evaporating freely under high vacuum. Two conditions exist, either that surface is rapidly working, or that it is quiet to torpid. Torpidity is associated with impurities, and reduces the rate of evaporation.

These latter studies were made in a barrel tensimeter described in the final article. It was also used to obtain accurate data on the above systems and compared with other stills. E. J. C.

343. Vapour–liquid equilibria. A. Wilson and E. L. Simmons. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2214–19.—Data reported on the system 2-propanol–water over the pressure range 95 mm to 4 atm. E. J. C.

344. Perforated-plate distillation columns. F. D. Mayfield, W. L. Church, Jr., A. C. Green, D. C. Lee, Jr., and R. W. Rasmussen. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2238–49.—A 6·5-ft dia experimental sieve plate was used to study pressure drops using the system air–water at 1 atm and 60° F. Relevant data is plotted for air rates up to 2000 lb/hr/sq. ft. of column area. Tray efficiencies are also reported for a 6·0-ft dia, 60-tray sieve plate column, and a 2·0-ft dia, 35-tray bubble cap column using mixtures of lower aliphatic alcohols at approx atmospheric pressure. Up to the limit of its boil-up rate, the sieve plate column showed better efficiencies than the bubble plate column. E. J. C.

345. Vapour–liquid equilibria at 760 mm pressure. L. H. Ballard and M. Van Winkle. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2450–3.—Data reported on the systems 2-propanol–methanol, 2-propanol–ethyl alcohol, 2-propanol–propanol, and 2-propanol–2-butyl alcohol. E. J. C.

346. Mechanism of mass transfer on bubble plates. F. B. West, W. D. Gilbert, and T. Shimizu. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2470–8.—Apparatus and procedure described for investigating mass transfer coefficients in the liquid and gas phases. Data obtained were for perforated plates, and were compared with similar results for a bubble-cap plate. Use of the data is explained by two examples, the first being the prediction of a point efficiency for rectification of methanol–H_2O, and the second, a similar prediction for the furfural extractive distillation of *iso*butane from 1-butene. E. J. C.

347. Separation of 1- and 2-methylnaphthalenes by azeotropic distillation. J. Feldman and M. Orchin. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2909–14.—Suitable choice of pressure enabled the above isomers to be separated by azeotropic distillation using undecanol as the entrainer. Relevant vapour–liquid equilibria for each isomer with undecanol also given at pressures from 20 to 400 mm Hg. E. J. C.

348. Patents. U.S.P. 2,596,249 (27.10.48; 13.5.52). F. J. Kerrigan. Bubble tower in which a bubble tray composed of a plurality of sectional plates is removably mounted on a flange extending round the inside of the tower, the sectional plates being held against the flange by compression screws carried on hold-down straps removably connected to mounting posts on the flange.

U.S.P. 2,598,036 (23.1.51; 27.5.52). J. T. Cahill and G. W. Jandacek, assrs to Universal Oil Products Co. Heating and liq level control apparatus for use with a fractionating column *A* in which an elongated vertical float chamber *B* connects with the lower liq reservoir *C* of *A* and provides a liq level therein varying with that in *A*. *B* is provided with a number of vertically spaced electric coils, each connecting *via* an electric relay and a resistor to a reboiler heating coil positioned in indirect heat exchange with *C*, heating of which is controlled by a float chamber in *B* which moves with the varying liq level, and thereby cuts the electric fields of the spaced coils. Each resistor is connected successively with a thermocouple heating coil adjacent to a thermocouple which operates an automatic control instrument which operates a flow control means in a liq conduit connecting with *C*. V. P. P.

Absorption and Adsorption

349. Determination of liquid-film absorption coefficients: a new type of column and its application to problems of absorption in presence of chemical reaction. E. J. Stephens and G. A. Morris. *Chem. Engng Progr.*, May 1951, **47** (5), 232–42.—A new type of laboratory absorption column is described which is suitable for the determination of liquid-film matter transfer coefficients when reliable data on rates of diffusion are not available; this gives results for physical solution similar to those obtained in packed towers. If, then, the relative performance of the lab column and various packings is established for a known system, it is possible to predict the liquid-film coefficients for other systems with these packings by means of lab experiments. This procedure avoids the use of large quantities of gas and liquid required for a semi-tech. scale, and is particularly convenient for determination of absorption coeff for systems which involve chemical reaction in the liquid.

Details are presented of experiments on the absorption of chlorine from mixtures with air into an aqueous liquor containing ferrous and ferric chlorides, using the type of column described. A correlation is given covering the effects of liquid rate, concentration of unconverted ferrous chloride, and partial pressure of chlorine in the gas. Results are consistent with assumptions that a rapid reaction takes place in a narrow zone within the liquid film, and the rate of absorption is controlled by the rates of diffusion of the reactants. J. G. H.

350. Selective absorption of hydrocarbons. Pt II. G. Spengler and K. Krenkler. *Petrol. Refin.*, **31** (10), 133–36; *Erdöl u. Kohle*, III, July 1950. A. R. H.

351. How surface tension affects flooding in packed columns. W. M. Newton, J. W. Mason, T. B. Metcalfe, and C. O. Summers. *Petrol. Refin.*, **31** (10), 141–3.—Data are presented on the flooding velocities in a 4-inch dia absorption tower packed with ½-inch berl saddles. The surface tension was varied from 72 to 32 dynes/cm by adding a surface active agent to water. The data are correlated by inclusion of the cube of ratio of the surface tension of pure water to that of the solution in a logarithmic plot of the type proposed by Sherwood. A. R. H.

352. Dehydration of natural gas and light hydrocarbon liquids. Pt II. J. M. Campbell, W. Skiner, Jr., and L. Lawrence. *Petrol. Refin.*, **31** (10), 106–14.—(See Abs. No. 3152–1952.) Dry dessicants used for the dehydration of natural gas are discussed, and include activated alumina, Florite, and Sovabead. Alumina gel shows favourable properties, although it is not yet used commercially. The design and operating conditions of dry dessicant plants are discussed. A. R. H.

353. Mass transfer coefficients and interfacial areas for 1-inch Raschig rings. H. L. Shulman and J. J. DeGouff, Jr. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 1915–22.—Apparatus and experimental procedure reported for investigating the effects of gas rate, liquid rate, and diffusivity on Kg and a. Vaporization data for dry 1-inch naphthalene Raschig rings were expressed by $Kg = 0{\cdot}0137\, G^{0.65} \times \left(\frac{\mu}{\rho D}\right)^{-2/3}$. Vaporization data obtained with water-wetted naphthalene rings gave wetted packing areas as function of gas and liquid rates. E. J. C.

354. Adsorption of hydrogen and carbon monoxide and their mixtures by cobalt Fischer–Tropsch catalysts. J. C. Ghosh, M. V. C. Sastri, and K. A. Kini. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2463–70.—Adsorption of above gases and mixtures by two cobalt catalysts, one of which contained a chromium oxide promoter, was studied in the range 0 to 200° C. Chromium oxide increased the amounts and rates of adsorption. Each constituent was found to markedly influence the adsorption of the other. Isobaric and isothermal data are presented in graphical form. E. J. C.

355. Percolation decolorization of a lubricating oil fraction by Fuller's earth. W. T. Granquist and H. J. Streich. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2898–903.—A steam-refined cylinder oil stock was decolorized by floridin earth which had been activated at temperatures in the range 600° to 1500° F. Experiments indicated a decrease in amount of resin adsorbed and an increase in the m.w. of the benzene-soluble portion of the resin as clay activation temperature was increased. E. J. C.

356. Processing and recovery of light hydrocarbons in the field. J. M. Campbell and R. N. Maddox. *Oil Gas J.*, 1.12.52, **51** (30), 122.—An economic investigation shows that revenue from a given lease may be substantially improved by application of new processing methods, and that stabilization is indicated where low temperature separation is advisable. Flow sheets and economic comparison tables are given. G. A. C.

Solvent Extraction and Dewaxing

357. Liquid liquid extractor design. F. D. Mayfield and W. L. Church, Jr. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2253–60.—An 8½-inch dia perforated plate column was used to visually study liquid–liquid extraction, and a 2-inch column was used to study tray efficiencies. Systems used were toluene–water–benzoic acid, and ethyl acetate–water–acetic acid. Results indicated that perforated or jet type plates offer excellent means of carrying out clean liquid–liquid extractions on a commercial scale. Experimental studies have been used for large scale design. E. J. C.

358. Patents. U.S.P. 2,594,044 (14.2.50; 22.4.53). D. J. Loder, assr to E.I. du Pont de Nemours & Co. Solvent extraction of mineral oils with dimethylammonium dimethylcarbamate. R. C. R.

U.S.P. 2,595,468 (24.6.47; 6.5.52). W. Kiersted and H. H. Gross, assrs to Texaco Development Corpn. Crude wax cake is mixed with a solvent for the impurities and heated to a temp from 5° to 50° F above the separation temp (*i.e.*, at which solid wax is present in soln of impurities), so that 2 to 30% of wax dissolves, the soln then being cooled to the separation temp and solid wax removed.

U.S.P. 2,595,516 (11.8.48; 6.5.52). E. W. Doughty, J. V. Murray, and J. D. Fales, assrs to Union Carbide and Carbon Corpn. Phenols are recovered from mixtures with hydrocarbons by extracting with an aq soln containing $\geq$ 20 wt % alkali metal phenolates, the free phenols in the extract being extracted with a neutral solvent containing a non-terminal CO group which is immiscible with 40% aq NaOPh and boils $<$180° C.

U.S.P. 2,596,010 (9.12.48; 6.5.52). C. C. Crawford, assr to Phillips Petroleum Corpn. Selective extraction of vegetable oils with a minimum of colour bodies therefrom by contacting the flaked vegetable material with C_6 isoparaffins containing $\leq$80 vol % of 2- and/or 3-methylpentane, $\geq$5 vol % aromatics, and $\geq$5 vol % naphthenes. V. P. P.

Cracking

359. Catalytic cracking techniques in Review. Pt 1. M. Sittig. *Petrol. Refin.*, **3** (9), 263–316.—Discussed in this extensive summary of the catalytic cracking process are the chemical and engineering fundamentals, operations, and maintenance aspects of fixed bed, moving bed, and fluidized catalytic cracking. 545 references. (Author's Abstract.) A. R. H.

360. Synthetic fluid cracking catalysts. C. O. Brown and R. B. Wainwright. *Oil Gas J.*, 1.12.52, **51** (30), 133.—Ranges of application, reaction severity, utilization of catalysts, catalyst make-up, fluid action, attrition, bed density and catalyst losses, elutriation, and unit design are dealt with. Efficient catalyst utilization is accomplished as a result of the combined effects of catalyst particle size operating conditions, catalyst properties, and unit design. G. A. C.

361. Experimental catalytic and thermal cracking at high temperature and high space velocity. R. C. Archibald, N. C. May, and B. S. Greensfelder. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 1811–17.—Apparatus, experimental procedure, and results are published for an investigation carried out to minimize coke formation on catalysts by use of higher temperatures and space velocities. Temperatures up to 700° C were employed using induction heating, and the results showed that catalyst coke reduced with temperature with cetane, cumene, and a West Texas gas oil as feed. This decrease in coke corresponded with an increase in low molecular weight gases. Very high space rates were necessary at the higher temperatures to maintain constant conversion. E. J. C.

362. Pyrolytic and catalytic decomposition of hydrocarbons. V. Haensel and M. J. Sterba. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2073–81.—Annual review up to May 1952. 124 references. E. J. C.

363. Patents. U.S.P. 2,595,224 (29.10.47; 6.5.52). C. L. Caldwell, assr to Houdry Process Corpn. In a conversion process in which a cylindrical compact non-turbulent bed of fluent cat is passed downward through a conversion zone *A* countercurrent to hydrocarbon vapours *B*, part of the cat is withdrawn as a compact column at an intermediate point in the bed and separated from *B* at the point of removal, loss of *B* from *A* being prevented by introducing an inert gas under greater pressure than is maintained in *A* into the withdrawn cat, the mass velocity of the cat below the withdrawal point thereby being reduced.

U.S.P. 2,596,145 (21.12.48; 13.5.52). H. W. Grote, assr to Universal Oil Products Co. Process for simultaneous reforming of olefin-free gasoline stocks of relatively high and low naphthene contents, by cat dehydrogenating a straight-run gasoline containing naphthenes and paraffins to convert the naphthenes to aromatics and hydrogen, adding to the resulting product sufficient of a predominantly paraffinic, naphthene-lean gasoline fraction to reduce the aromatic content to $<25\%$, and then hydrocracking the mixture in presence of a Pt–Al_2O_3–halogen catalyst to convert higher boiling paraffins to lower boiling paraffins.

U.S.P. 2,595,909 (5.12.49; 6.5.52). R. P. Trainer and L. E. Border, assrs to Shell Development Co. Conversion process employing a fluidized cat in which the cat flows downwards in dense phase from an elevated hopper through the regenerator and then through the reactor and upwards in dilute phase from the reactor to the hopper via a stripper in which the spent cat is stripped.

U.S.P. 2,598,641 (18.5.49; 27.5.52). L. W. Head, assr to Socony-Vacuum Oil Co. Inc. Method and apparatus for preventing escape of fluids from a vessel where they are contacted with a continuously flowing hot particulate contact mass at pressures above that of the supply hopper, when the flow through the feed leg is interrupted, causing loss of seal. The invention aims to close the feed leg automatically after rupture of the seal, to actuate a warning device to indicate impending rupture of the seal, and to prevent the reactor from being drained of cat when the flow of cat is interrupted.

U.S.P. 2,598,309 (3.11.48; 27.5.52). T. Say and J. F. McKinney, assrs to Sun Oil Co. Active life of silica-alumina cracking catalysts is prolonged by operating a stationary bed process *A* in conjunction with a moving compact bed process *B*, the cat being used and regenerated in *A* until partially and permanently deactivated and then transferred to *B*, where they undergo further deactivation before final removal.

U.S.P. 2,597,346 (29.10.48; 20.5.52). F. W. Leffer, assr to Universal Oil Products Co. Continuous conversion process in which a bed of heat retentive solid particles *A* is moved downwardly through a reaction zone *B* and a superimposed heating zone *C*; an organic reactant stream is passed upwardly through *B*, conversion products being withdrawn from the top of *B* and *A* from the bottom of *B*. Withdrawn *A* is passed as a suspension in hot combustion gases upwardly in a confined straight path through *B* and *C* in heat exchange with the beds of *A* therein and discharged on to the top of the bed in *C*, where it is regenerated in a stream of oxygen containing gas.

U.S.P. 2,598,058 (6.1.50; 27.5.52). W. K. Hunter, assr to Universal Oil Products Co. Process for continuous conversion and coking of heavy hydrocarbons by contacting with hot particles in which the hydrocarbon vapours from the coking and conversion zone are fractionated in a fractionating zone *A* and unvaporized bottoms, together with hot regenerated particles are passed to a flash zone, the vapours produced being condensed separately and then passed to *A* for fractionation, while a slurry of unvaporized hydrocarbons and cooled particles is withdrawn.

U.S.P. 2,596,748 (10.7.48; 13.5.52). K. M. Watson and R. L. Smith, assrs to Sinclair Refining Co. Cat process in which fresh cat is added to the system during a relatively brief make-up period *A* and cat fines carried overhead from the regeneration zone are returned to the system during and after *A* until cat inventory and average activity have fallen to a level necessitating addition of fresh cat, and are rejected from the system immediately prior to *A*.

U.S.P. 2,596,611 (7.4.48; 13.5.52). W. L. Weidman, H. A. Shabaker, and E. B. Cornelius, assrs to Houdry Process Corpn. Method of chemically treating finely divided solid *A* in which *A* forms a plurality of layers at spaced levels in a vertical reaction zone and is flowed down from one layer to the next at progressively increasing temp. *A* is withdrawn from the lowest layer and contacted at reduced temp in dense fluidized state with conc reactive gas *B*, *B* then being separated and passed to a mixing zone below the lowest layer, where it is mixed with inert gas which has been used to cool *A* after separation from *B* and has thereby been heated at least to reaction temp, the gaseous mixture then being passed upwards through the layers of *A* at a rate such that *A* forms a dense turbulent fluidized mass in each.

U.S.P. 2,596,610 (17.3.48; 13.5.52). H. A. Shabaker, assr to Houdry Process Corpn. Apparatus for contacting gaseous fluids with freely flowable solids *A* which comprises a vertical chamber through which *A* flows by gravity on to a bottom member *B* forming a support for a bed of *A*. *B* is provided with conduits arranged in horizontal concentric circles, those in the outer circle sloping downwards and inwards, and those in the inner circle sloping downwards and outwards, so that the outlet ends form a common horizontal circle below *B*. *A* can thus be withdrawn through the conduits uniformly over the entire lateral cross-section of the chamber.

U.S.P. 2,596,609 (6.2.48; 13.5.52). H. A. Shabaker, assr to Houdry Process Corpn. Sulphidation of solid materials *A* in which *A* is heated to reaction temp by contact with a relatively large vol of a preheated inert carrier gas containing a small proportion of sulphiding gas *B* after which *A* is treated in a second zone with a relatively small vol of conc *B* at a lower temp than *A*. *E.g.*, purification of clay by converting its iron content to iron sulphide.

U.S.P. 2,596,299 (30.11.43; 13.5.52). T. P. Simpson, assr to Socony-Vacuum Oil Co. Inc. Apparatus for conducting thermochemical conversions in presence of moving solid particles, which is partitioned into a series of vertically superimposed chambers, the intermediate chambers being provided with heat exchangers which enable the temp to be accurately and flexibly controlled.

U.S.P. 2,595,384 (7.12.50; 6.5.52). J. H. Johnsen and N. H. Snyder, assrs to Standard Oil Co. Grid seal particularly applicable to regenerators of fluid cat cracking systems. The seal is provided by metal plates of the same curvature as the periphery

of the grid sections, the plates having a rounded lower surface for contacting the upper surface of a ledge which extends inwardly from the reactor wall underneath the peripheral edges of the grid sections. The plates are held close to these edges by holders co-operating with brackets on the grid section so that the rounded lower edges of the plates may bear against and slide upon the inwardly extending ledge while the outer surfaces of the grid plate may move along the vertical surfaces of the curved plates while the plates remain in contact with the vertical ledge. The seal is thus effected between the rounded lower edges of the arcuate plates and the inwardly extending ledge, and between the vertical inner sides of the arcuate plates and the periphery of the grid sections.

U.S.P. 2,597,889 (1.9.45; 27.5.52). T. H. Milliken and I. H. Welinsky, assrs to Houdry Process Corpn. Production of agglomerated gel pieces by drying a silica–zirconia hydrogel of pH$<$7, removing alkali metal cations therefrom, forming a paste of the dried gel, shaping into pieces, drying, and calcining.

U.S.P. 2,595,943 (26.4.49; 6.5.52). H. Heinemann, assr to Porocel Corpn. Thermally activated bauxite granules are hardened by pptg thereon 2 to 10 wt % of $CaSO_4$ from a sol Ca salt and then heating at $<$1200° F.

U.S.P. 2,595,339 (29.12.48; 6.5.52). M. D. Herder and L. Heard, assrs to Standard Oil Co. Preparation of a silica–alumina catalyst by mixing an alumina hydrosol of pH 3·5 to 6·5 into a silica hydrosol of pH 3·5 to 6·5, allowing the mixture to set, and washing, drying, and calcining the ultragel.

U.S.P. 2,595,415–16 (29.9.48; 6.5.52). L. Schmerling, assr to Universal Oil Products Co. Alumina containing γ-alumina is mixed with $\leq$4 moles of a carboxylic acid of $\leq$60 wt % concn at 150° to 300° C under sufficient pressure to maintain a substantial portion of the acid in liquid phase until the γ-alumina is converted to a basic Al salt of the acid, thereafter heating the salt at 250° to 800° C to form a porous alumina.
V. P. P.

Hydrogenation

364. Catalyst evaluation and middle oil preparation in an experimental high pressure coal hydrogenation plant. H. J. Kandiner, R. W. Hiteshue, and E. L. Clark. *Chem. Engng Progr.*, Aug. 1951, **47** (8), 392–6; Sept. 1951, **47** (9), 455–61.—Plant equipment and layout of a coal hydrogenation pilot plant of the Bureau of Mines are described in detail, together with a discussion of methods for operating the plant and evaluating the data obtained. Five operating runs at 460° C and 3500 p.s.i. with 35% coal paste are reported, and the results produced in liquid phase hydrogenation of bituminous coal by tin, zinc, nickel, and iron catalysts, and also in the absence of any added catalyst are compared. The exceptional activity of tin catalyst, hitherto regarded as unique for this purpose, could be closely duplicated in respect of liquefaction and "asphalt" formation by nickelous chloride catalyst impregnated on the raw coal from aqueous solution. Operation in a simulated recycle manner to produce middle oil from Rock Springs coal using tin catalyst is also described. J. G. H.

365. Hydrogenation and hydrogenolysis. J. S. Cromeans. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2025–36.—A review is presented under section headings, *e.g.*, Fischer–Tropsch process, hydrogenation of petroleum, etc., and covers 323 references.
E. J. C.

366. Patent. U.S.P. 2,595,772 (8.12.49; 6.5.52). R. L. Daussat and C. T. Steels, assrs to Standard Oil Development Co. Co-pptn of a Group VI (*a*) metal (tungsten) sulphide with an iron group metal (nickel) sulphide is carried out in a non-acid medium, preferably at pH about 8, by adding to an aqueous ammonium thio salt solution of the Group VI (*a*) metal, containing sulphide ions at least equivalent to the metals to be pptd, the iron group metal in the form of a salt (carbonate), the anion of which forms with the ammonium cation a compound which dissociates into normally gaseous constituents on heating the aq soln to *ca* 230° F, and then separating the ppt by evaporating the liquid. V. P. P.

Polymerization

367. Polymerization. C. C. Winding and H. F. Wiegandt. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2052–64.—A short review is made of the subject, but 585 references are appended. E. J. C.

368. Patents. U.S.P. 2,593,417 (24.9.49; 22.4.52). G. F. D'Alelio, assr to Koppers Co. Inc. Polymerizing an ethylenic monomer in the presence of an aryl resin containing a plurality of sulphonic acid groups. R. C. R.

U.S.P. 2,596,497 (13.10.49; 13.5.52). J. M. Mavity, assr to Universal Oil Products Co. A calcined composite of a phosphoric acid *A* and a solid carrier is treated with sufficient aluminium and/or boron compound to form with *A* *ca* 10 wt % of the metal phosphate and then calcined to give a cat of increased structural strength.

U.S.P. 2,596,498 (20.10.49; 13.5.52). J. M. Mavity, assr to Universal Oil Products Co. Thermal stability of a calcined composite of a phosphoric acid *A* and a solid carrier is increased by treatment with an organo compound of magnesium and/or zinc which will react with *A* to form 1 to 10 wt % of the metal phosphate and then recalcining.

U.S.P. 2,597,951 (28.10.50; 27.5.52). H. Romeyn and C. D. McCleary, assrs to United States Rubber Co. Preparation of rubbery copolymers containing 40 to 80% M.E.K. insol gel having a swelling index in M.E.K. of 8 to 35 and a Mooney visc of 40 to 80 at 212° F, by copolymerizing butadiene and acrylonitrile in aq emulsion in initial absence of a cross-linking agent and, when 10 to 35% has polymerized, adding 0·7 to 1·5 wt % of divinylbenzene, based on monomers, and continuing polymerization until 60 to 80% of the original monomers has polymerized.

U.S.P. 2,596,975 (1.9.49; 20.5.52). J. H. Bannon, assr to Standard Oil Development Co. Polymerization process in which *iso*butylene is mixed with a minor proportion of a C_{4-14} hydrocarbon containing <2 aliphatic unsaturated linkages and styrene at $-40°$ to $-110°$ C, and 1 to 20 vol of inert non-solvent diluent is added. The cold mixture is circulated at a flow velocity of 8 to 25 f.p.s., simultaneously producing therein a Reynolds' turbulence number of 2,500,000 to 4,500,000 and adding a liquid catalyst to effect polymerization and yield a fine-grained slurry of solid polymer with minimum adhesion of polymer to the container walls. V. P. P.

Alkylation

369. Alumina activated with anhydrous hydrogen fluoride: a dealkylation catalyst for aromatic hydrocarbons. L. Berg, E. O. Kindschy, W. S. Reveal, and H. A. Saner. *Chem. Engng Progr.*, Sept. 1951, **47** (9), 469–72.—Hydrogen fluoride activated alumina was evaluated as a dealkylation catalyst for aromatic hydrocarbons by reaction with toluene, xylenes, ethyl benzene, diethyl benzenes, *iso*propyl benzene, monoamyl benzene, diamyl benzenes, and triamyl benzenes as the dealkylated reagents. Benzene was found to be the ultimate dealkylation product of every aromatic hydrocarbon containing two or more carbon atoms in every branch chain, while toluene was the ultimate product of any aromatic hydrocarbon containing only one carbon atom in any of its branch chains. Data obtained showed that with increased temp, other conditions being equal, dealkylation increased and alkylation decreased. J. G. H.

370. Alkylation. R. B. Shreve. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 1972–9.—Review covering 199 references, many of which refer to the petroleum and petrochemical industries. E. J. C.

Isomerization

371. Isomerization. S. F. Perry. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2307–9. Review of literature for 1950–2, covering forty-four references. E. J. C.

372. Inhibition of side reactions during aluminium chloride-catalyzed pentane isomerization. E. E. Sensel and A. R. Goldsby. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2716–21.—Side reactions which occur when pure pentane is isomerized in the presence

of $AlCl_3$ include cracking, alkylation, polymerization, etc., and the catalyst is gradually converted to an inactive complex. The experimental work reported studied the effect of adding *iso*butane to liquid pentane during the isomerization. It was found that side reactions and catalyst deterioration were greatly reduced when a ratio of 2 parts by weight of *iso*butane to 1 part of *n*-pentane was employed. The effectiveness of *iso*butane, in this respect, decreased when isomerization was carried out in the gaseous phase. E. J. C.

Chemical and Physical Refining

373. Operating glycol–amine treating plants. M. Atcheson and A. A. Cohn. *World Oil*, Oct. 1952, **135** (5), 297.—A discussion on the problems of operating such a plant, which is used for the removal of carbon dioxide and hydrogen sulphide from sour gas. The main points are the reduction of the contactor capacity by the accumulation of corrosion products in the bubble cap, the deterioration on the glycol–amine solution, and the general loss of solution. Flow diagram and references. A. J. H.

Special Processes

374. Solvent drying. R. J. Mitchell. *Chem. Engng Progr.*, Dec. 1951, **47** (12), 649–53.—A method is presented for the distillation drying of solvent mixtures such as M.E.K. and benzene used in wax manufacture. A design procedure included uses a modification of the McCabe–Thiele graphical method. Distillation of the three component system M.E.K.–benzene–water is effected in two steps: water stripping at constant benzene composition and benzene enrichment of a water saturated solvent. Equilibrium data for the ternary system are given; operating data from a commercial drier indicate plate efficiencies of 30% water stripping section and 80% for benzene enrichment. The integration of such a drier into the solvent-recovery system of a wax de-oiling plant is also discussed. J. G. H.

375. Producing fuel oil from coal. E. L. Clark, R. W. Hiteshue, and H. J. Kandiner. *Chem. Engng Progr.*, Jan. 1952, **48** (1), 15–20.—A series of pilot plant studies for the conversion of coal into fuel oil at an operating pressure of 1500 p.s.i. are reported. Previous experimental work in this direction is noted, and the value of low pressure operation in facilitating the use of standard, easily available equipment is stressed. The plant used and methods of operation and control are described. From an economic angle, whilst the operation of a low pressure process does not appear to present marked advantages, the ability to make use of standard equipment and of welded rather than forged vessels should make this type of plant of special significance in national emergencies or in localities where fuel is obtainable only by importation. J. G. H.

376. Sulphonation and sulphation. E. E. Gilbert and E. P. Jones. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2082–109.—Review of literature for 1951, including applications to petroleum fractions. 413 references. E. J. C.

377. Liquid thermal diffusion of tall oil. A. L. Jones and R. W. Foreman. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2249–53.—Details given of apparatus and procedure used to fractionate tall oil by thermal diffusion. E. J. C.

378. Effect of granule size in dehydrogenation of butane and in a hydrogen transfer reaction. R. W. Blue, V. C. F. Holm, R. B. Regier, E. Fast, and L. F. Heckelsberg. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2710–16.—Butane dehydrogenation over chromia–alumina catalyst at 530° C and hydrogen transfer (from Decalin to *iso*butene) over silica alumina at 340° C were studied with various sizes of catalyst. In both cases granules larger than 35 mesh were less effective than smaller granules. Spread in activity between 0·125-inch pellets and 30-mesh crushed granules was 35% for butane dehydrogenation and 500% for hydrogen transfer, catalysts being compared at same coke level.

Mass transfer of butane from inner portions of the catalyst was also studied by saturating the catalyst with butane containing radioactive carbon, passing unlabelled butane over the catalyst, and measuring the rate of appearance of radioactivity in the effluent. This rate was also much greater for the smaller granules. It was concluded

that mass transfer rates inside catalyst granules are important in butane dehydrogenation and cat cracking. E. J. C.

379. Patents. U.S.P. 2,592,762 (24.1.46; 15.4.52). J. E. Taylor and J. H. Haslam, assrs to The Girdler Corpn. Separating CO_2 from gaseous mixtures by treatment with aqueous monoethanolamine, wherein the resulting effluent mixture of stripped gas and amine-containing fog is treated to remove the fog by heating the effluent and thereafter cooling it by scrubbing with an aqueous spray.

U.S.P. 2,592,964 (5.5.49; 15.4.52). A. I. Smith, assr to Union Oil Co. Producing succinic acid by oxidizing a paraffinic hydrocarbon with gas containing free oxygen at 100° to 160° C, washing the product with water, dehydrating the extract by distillation in the presence of an aromatic hydrocarbon having less than 9 C atoms per mol, and cooling the residue to separate succinic acid therefrom.

U.S.P. 2,593,001 (31.1.50; 15.4.52). H. Bender and H. M. Pitt, assrs to Stauffer Chemical Co. Producing *p*-monochlorodiphenyl sulphone by reacting benzene sulphonic acid with at least twice the stoichiometric quantity of anhydrous monochlorobenzene vapour.

U.S.P. 2,593,009 (31.10.49; 15.4.52). A. Clark and F. E. Condon, assrs to Phillips Petroleum Co. Condensing lower alcohols to higher alcohols.

U.S.P. 2,593,232 (18.7.47; 15.4.52). K. M. Watson, assr to Sinclair Refining Co. Concentrating or purifying CO occurring in a mixture with other gases by absorption of the CO as nickel carbonyl and subsequent thermal decomposition of the carbonyl to regenerate CO and nickel.

U.S.P. 2,593,406 (26.12.47; 22.4.52). D. A. Berry, assr to Diamond Alkali Co. Preparing azo dyes from an amine prepared by hydrolysing an anilide obtained by reacting an 18 to 36 C atom chlorinated paraffin wax with twice its weight of acetanilide.

U.S.P. 2,593,451 (25.6.47; 22.4.52). H. W. Hill and E. L. Dance, assrs to The Dow Chemical Co. Dehydrochlorinating a polychlorinated ethane by heating in the liquid phase in the presence of anhydrous $FeCl_3$.

U.S.P. 2,593,561 (4.9.48; 22.4.52). W. A. Herbst and W. C. Howell, assrs to Standard Oil Development Co. Preparing rich-mixture aviation fuel containing less than 6% of ortho-substituted C_8 and C_9 aromatics based on the total weight of aromatics.

U.S.P. 2,593,746 (17.6.50; 22.4.52). W. K. T. Gleim, A. Gaydasch, and R. H. Rosenwald, assrs to Universal Oil Products Co. Producing tetra-substituted alkyl and alkyloxy stilbene quinones from di-alkyl or di-alkoxy *p*-cresols by heating at 20° to 100° C in the presence of an oxidizing agent comprising an alkali metal chlorate or ferricyanide, lead dioxide, or silver oxide.

U.S.P. 2,594,149 (5.3.48; 22.4.52). B. W. Gamson, assr to Great Lakes Carbon Corpn. Process for producing elemental sulphur by the non-catalytic combustion of H_2S at above 2400° F and cooling the combustion gases to below 900° F at more than 200° F per second.

U.S.P. 2,594,541–2 (22.12.49; 29.4.52). M. De Groote and B. Keiser, assrs to Petrolite Corpn Ltd. Breaking water-in-oil petroleum emulsions by adding thereto a mixture including a homologous series of glycol ethers of (*a*) oxyalkylation susceptible, fusible, organic solvent-soluble water insoluble, phenolic resins or (*b*) phenol-acetylene resins.

U.S.P. 2,594,554 (30.11.50; 29.4.52). O. M. Hanson and C. B. Linn, assrs to Universal Oil Products Co. Concentrating HF by contacting an aqueous solution thereof with another substantially anhydrous liquid hydrogen halide.

U.S.P. 2,594,370 (14.5.47; 29.4.52). D. M. Warburton, assr to Diamond Alkali Co. Method of separating metal halides by extraction with a halogenatable liquid hydrocarbon.

U.S.P. 2,594,454 (31.5.46; 29.4.52). G. M. Kosolapoff, assr to Monsanto Chemical Co. Organic phosphorus acids and esters produced by mixing a hydrocarbon, PCl_3 and $AlCl_3$ and adding chlorine to the mixture.

U.S.P. 2,594,455 (3.6.49; 29.4.52). G. M. Kosolapoff, assr to Monsanto Chemical Co. Dialkyl phosphoryl monoethyl hydrocarbon phosphonates are produced by reacting a dialkyl ester of a hydrocarbon phosphonic acid with ethyl metaphosphate.

U.S.P. 2,594,481 (30.9.48; 29.4.52). N. J. Bowman and A. W. Weitkamp, assrs to Standard Oil Co. Separating an aliphatic alcohol from a mixture by urea extraction wherein the alcohol is converted into a monomethyl branched ester containing at least 4 methylene groups in the terminal chain containing the –COO group.

U.S.P. 2,594,570 (28.11.50; 29.4.52). C. B. Linn, assr to Universal Oil Products Co. Isomerization of $\alpha\beta$ unsaturated carboxylic acids by heating the cis compound in the presence of a cycloalkanone catalyst.

U.S.P. 2,594,690 (30.4.48; 29.4.52). W. H. Shiffler, assr to California Research Corpn. Continuously producing salts of a surface active alkylaryl sulphonic acid by neutralization followed by spray-drying.

U.S.P. 2,594,875 (30.4.48; 29.4.52). D. H. Condit, assr to California Research Corpn. Neutralizing and spray-drying a surface-active sulphonic acid.

U.S.P. 2,595,096 (20.5.48; 29.4.52). P. T. Parker, assr to Standard Oil Development Co. Synthesis of alcohols by contacting olefins, CO, and H_2 with a cobalt catalyst and subsequently hydrogenating the reaction products, distilling off alcohol, hydrolysing the distillation residue, and hydrogenating the hydrolysis products.

R. C. R.

Metering and Control

380. Modern developments in instrument panels. L. Walter. *Mech. World*, Dec. 1952, **132** (3401), 257.—Modern process instrument panels contain standardized measuring and controlling instruments mounted on standard sections for easy maintenance. In oil and chemical industries new miniature instruments are inserted in simplified flow diagrams mounted on control panels, and telemetering instruments allow automatic or manual control from the panel. Several types of panel are described and illustrated. Recent developments are summarized, and probable future trends are discussed. Nine references. T. T.

381. Patent. U.S.P. 2,595,948 (16.6.48; 6.5.52). J. M. Jones and J. J. Stranahan, assrs to The Texas Co. Automatic dist testing method in which a sample is withdrawn from a dist operation *via* a valved supply line and passed to an electrically heated still, where it is vaporized and the dist temp measured. Heating of the test still is continued until there is a predetermined increase in temp, whereupon, automatically, the heating stops and a fresh sample of test liquid flows into the test still, the supply being automatically cut off when temp of the test still has fallen to a predetermined level. V. P. P.

Products

Chemistry and Physics

382. Mixed hydrocarbon solvents for fatty acids and the triglycerides. R. Bogash and A. N. Hixson. *Chem. Engng Progr.*, July 1951, **47** (7), 347–53.—Investigation of the solubility relationships of fatty acids and their triglycerides in mixtures of methane and propane indicate that the addition of methane effectively lowers the critical solution temp for a given solute.

Equilibrium data are presented for the system stearic acid–propane–methane at 84·4° C and 71° to 72° C and for the system trimyriston–propane–methane at 69·6° C and 61° C. The corresponding critical solution temp for the propane binary solution is 91·4° C for stearic acid and 79·4° C for trimyriston.

A method is presented for the determination of conjugate liquid compositions from equilibrium data obtained by the synthetic method when the pressure is always in equilibrium with one or two phases.

The use of methane mixtures in increasing the versatility of propane as a selective solvent is indicated. J. G. H.

383. The viscosity, thermal conductivity, and specific heat of dry air at elevated pressure and temperatures. I. Granet and P. Kass. *Petrol. Refin.*, **31** (10), 113–14.—Graphs are presented showing the viscosity, thermal conductivity, and specific heat of air at temperatures from 100° to 1500° C and pressures up to 2000 p.s.i.a. A. R. H.

384. Effect of water vapour on explosions of carbon monoxide. D. E. Hoare and A. D. Walsh. *Nature, Lond.*, 1952, **170**, 838.—It is found that, whilst water vapour has no effect on the lower explosion limit and the lower glow (slow oxidation) limit of CO–O_2 mixtures, it raises both the upper explosion and upper glow limits, and hence reduces the temp of the tip of the explosion peninsula. Also, the explosion peninsula is expanded by small, and contracted again by large, quantities of methane. H. C. E.

385. Properties of high boiling point petroleum products. W. A. Dietz, W. H. King, Jr., W. Priestley, Jr., and J. Rehner, Jr. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1818–27.—An extensive study is reported of modern petroleum fractions found to be carcinogenic towards mice. Fractions investigated were catalytically cracked products, slack waxes, lubricating oil stocks, virgin gas oils, and crude residues. High b.p. catalytically cracked fractions above 700° F had high tumour forming tendencies, while those boiling below 700° F were essentially innocuous, and evidence showed that these tumour forming tendencies were associated with the aromatic fractions. Lower potencies were found for very high boiling point bottoms of catalytically cracked stocks. Virgin gas oils had moderate carcinogenic tendencies, while in the main, lubricating oil stocks and petroleum slack waxes had low potencies or were innocuous. Where carcinogenicity was found, it appeared attributable to aromatic constituents. Tars in general had low potencies, those from thermally cracked naphtha and reduced crudes being less potent than tars from catalytically cracked gas oil and steam cracked paraffin distillates. Highly refined products, such as white oils and petrolatum, were innocuous. E. J. C.

386. The reaction between methane and steam. A. S. Gordon. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1857–9.—Results of studying the reaction between steam and methane when passed through a heated tube at 1000° to 1100° C are reported. Concluded that carbon must be formed by CH_4 decomposition before steam can enter into the reaction. E. J. C.

387. Composition of virgin, thermal, and catalytic naphthas from Mid-Continent petroleum. W. E. Cady, R. F. Marschner, and W. P. Cropper. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1857–64. Results given of a ten-year research programme designed to reduce important refinery streams to a list of individual compounds. Thermal cracking of the heavy part of Mid-Continent petroleum gave light cracked hydrocarbons similar to those light hydrocarbons originally present in the crude petroleum. Catalytic cracking of the intermediate part of crude gave light hydrocarbons substantially different from those present in the virgin stock. This suggested a free radical mechanism for thermal cracking and a carbonium-ion mechanism for catalytic cracking. Distribution of hydrocarbons by type and no. of carbon atoms is shown in tables. E. J. C.

388. Oxidation. L. F. Marek. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2044–52.—Review. 135 references. E. J. C.

389. Polymer chemistry of the linear siloxanes. E. L. Warrick, M. J. Hunter, and A. J. Barry. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2196–202.—Chemistry and properties of the above compounds are described. Fluid siloxanes are reported to be useful lubricants, and in certain cases, as antilubricants. E. J. C.

390. Isobaric heat capacity of propane. J. H. Seifarth and J. Joffe. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2894–7.—Calculated values of the difference in specific-heats of propane at constant pressure and those of an ideal gas are plotted over the range 0 to 10,000 p.s.i.a. E. J. C.

391. New method for calculating the composition, internal energy, enthalpy, and entropy of a dissociable gas. B. Salé. *Rev. Inst. franç. Pétrole*, 1952, **7**, 380–9.—A new graphical method is given, permitting an easy calculation of the composition of

combustion products, with allowances for dissociation equilibria. All results are plotted against one of the following two parameters:

$$\frac{[CO]}{[CO_2]} \text{ or } a = \frac{[H_2O] + [OH] + 2[O_2] + [O]}{2[H_2O] + 2[H_2] + [H] + [OH]}$$

for the different values of the volume V or of the reduced volume

$$\frac{V}{2[H_2O] + 2[H_2] + [H] + [OH]}$$

A graphical chart enables the values of the parameters according to the initial composition of the mixture to be determined. Diagrams were established each 200° C from 2000° to 3000° K. Principle of the method is explained and use of these diagrams described, according to which pair of initial variables is required by the given problem pressure-temperature or specific volume-temperature. (Author's Summary.)

392. Part played by inert diluents in catalytic dehydrogenation of ethyl benzene. N. I. Shuikin and I. I. Levitzkii. *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk*, 1952, 592–602.—Tests carried out with vanadium oxide cat at 575° C. Cat regenerated between tests by air blowing at 575° to 600° C. Diluents used were H_2, N_2, toluene. Kinetics of reaction are examined and experimental yields compared with calculated. Max conversion obtained (32·2% styrene on ethyl benzene feed) was with N_2 dilution. Dehydrogenation reaction attains thermodynamic equilibrium over a wide range of space velocities; effect of diluent is to shift equilibrium position in direction of styrene. V. B.

Analysis and Testing

393. Crude evaluation—here is an approved method. J. B. Stripling. *Petrol. Refin.*, **31** (10), 137–9.—A method for the evaluation of mixed and paraffin base crude oils is presented. The oil is separated by distillation into 375° F end point gasoline, 520° F end point kerosine, gas oil, and an 80-sec at 130° F lubricating oil distillate adjacent to a 540° F flash point residuum. The lubricating oil is extracted with furfural, and the raffinate dewaxed with methyl ethyl ketone and toluene mixture. The residuum is dewaxed in a similar way with the addition of 5% diatomaceous earth and the dewaxed stock deasphalted with fuel oil. Methods have been developed for calculating dewaxing yields, the Duo-Sol yield, petrolatum yield, dewaxing yield from Duosol raffinate, and percolation yield from these data. A. R. H.

394. Polarizing and phase-contrast microscopes in the grease industry. R. Courtel and L. Pons. *Rev. Inst. franç. Pétrole*, 1952, **7**, 390–2.—One microscope with suitable attachments can serve for observation by ordinary light, by polarized light, and in phase contrast. Test is very rapid, sample being ready for examination within 2 min of being taken. Method is particularly applicable to long-fibre greases (*e.g.*, Na, Ca). Main purpose of proposed technique is process control, to indicate incipient faults not otherwise detectable, but grease deterioration in use can also be followed. Effects observed are illustrated by several photographs. V. B.

395. The micro-determination of the iodine values of oils by the Wijs method. C. Whalley and M. Ellison. *J. Oil Col. Chem. Ass.*, 1952, **35**, 596.—The apparatus consists essentially of the reaction vessel and titration unit. The titration unit was designed around a large Agla micrometer syringe burette. An electrometric method of end point determination is utilized—that due to Faulk and Bowden. The experimental procedure is described, and a table comparing results obtained by this method and by the method given in BS684 is included. D. K.

Crude Oil

396. Composition of United States crude oils. H. M. Smith. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2577–85.—The crude oil producing areas of the U.S. are divided into eight geographical areas. Certain characteristics of the crude oil produced in each area are discussed in this paper. Characteristics, based on the Bureau of Mines routine analysis, include the sulphur, asphalt, naphtha, gas oil, aromatics in both the naphthas and gas oils, and naphthene ring in the paraffin–naphthene portions of both

naphthas and gas oils. A total of 330 crude oils is included in this discussion. (Author's Abstract.) E. J. C.

397. Mechanism of occurrence of metals in petroleum distillates. R. A. Woodle and W. B. Chandler, Jr. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2591–6.—Vacuum steam distillations and molecular distillations of metal containing crudes, together with colour determinations on blends of distillates with residua, were carried out to find the mechanism by which the metals appeared in petroleum distillates. Concluded that presence of metals in vacuum distillates is caused by actual volatilization of low mol. wt. compounds present in the crude. E. J. C.

398. Petroleum acids and bases. H. L. Loehte. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2597–601.—Review of occurrence, isolation, and identification of acidic compounds and nitrogen compounds in crude oils and their fractions. Forty-four references. E. J. C.

399. Distribution of nitrogen in petroleum according to basicity. F. P. Richter, P. D. Caesar, S. L. Meisel, and R. D. Offenhauer. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2601–5.—Deleterious effect of N_2 in cat cracking operations and increasing usage of stocks high in N_2 content for this purpose have accentuated the need for fundamental information concerning the nature of these compounds in petroleum. The existence of basic N_2 compounds in virgin crudes has been proved by extraction with 5% aqueous HCl. Moreover, perchloric acid titration of a number of crude petroleums from widely different sources and of the distillate fractions of three crude oils has shown that a constant $0{\cdot}30 \pm 0{\cdot}05$ ratio of basic to total N_2 holds true generally in crude oils and virgin stocks, and does not vary with prolonged heating at 600° F. Work indicates that the types and relative proportion of types of N_2 compounds in various crudes are essentially the same, although relative amounts vary considerably. This is indicative of a common mechanism of formation for the various crudes. (Authors' Abstract.) E. J. C.

Gas

400. Patents. U.S.P. 2,598,248 (France 15.12.45; 27.5.52). E. Gagnan and J. Y. Cousteau, said Gagnan assr to L'Air Liquide, S.A., pour l'Etude et l'Exploitation des Procédés Georges Claude. Compressed gas cylinder from which gas is supplied through a valve which closes when the pressure falls below a certain value, and can be opened manually, *e.g.*, by a valve lifting device, so that remaining gas can be supplied.

U.S.P. 2,595,252 (3.6.48; 6.5.52). J. S. Haug, assr to United Engineers and Constructors Inc. In the cyclic manufacture of carburetted water gas, pet oil is preheated to >600° F by indirect heat exchange with hot combustion gases during the blow period and is flash vaporized during the run period while fresh oil is passed into the preheating zone.

U.S.P. 2,596,785 (8.7.46; 13.5.52). H. M. Nelly and T. E. Sullivan, assrs to J. F. Pritchard & Co. B.Th.U. content of natural gas is enriched by contacting the gas with an absorbing liq, cooling to effect condensation and solution of part of the gas, the residue gas being separated, further cooled and passed in counterflow to the liq to effect further condensation of methane and heavier components, and then fractionating the liq to recover enriched gas.

U.S.P. 2,596,469 (27.2.51; 13.5.52). D. P. Cooper, assr to Polaroid Corpn. Electric lamp having a filament of tantalum carbide in an atm of hydrogen and a volatile hydrocarbon. J. M. S.

Engine Fuels

401. Advantages of propane as a transit vehicle fuel. R. S. Lee. *SAE quart. Trans.*, Apr. 1952, **6** (2), 213–19.—The chemical and physical properties of propane, sources, production statistics, and history are briefly discussed. Its advantages as a fuel are considered from the standpoints of lower fuel costs, maintenance savings, greatest safety in handling, and public acceptance. The special requirements for bulk storage and for fuel systems are also set out. J. G. H.

402. Effectiveness of amyl nitrate in a full-scale diesel engine. M. J. Anderson and G. C. Wilson. *SAE quart. Trans.*, Apr. 1952, **6** (2), 230–40.—The value of ignition quality improvers in diesel fuels is noted, particularly in view of the prevailing tendency to use cracked stocks. The essential properties of a good ignition accelerator are enumerated, and details are given of an investigation into the possibilities of amyl nitrate as an ignition accelerator and into the qualities necessary in this respect, using a General Motors 3-71 diesel engine for the purpose. The results obtained indicate that fuel ignition quality as expressed by ASTM Cetane No. is a significant factor in controlling ignition and initial burning characteristics of fuels in full scale engines over a wide range of operating conditions, and that the overall Cetane No. requirement for a test engine is determined by the requirement for low-load, low-speed operation, this being greater than the requirement for high-load, high-speed operation. Amyl nitrate was found to provide ignition quality to satisfy both these requirements.
J. G. H.

403. Flame velocities of liquid hydrocarbons. R. E. Albright, D. P. Heath, and R. H. Thena. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2490–6.—Flame velocities are reported for various hydrocarbons and alcohols in the range covered by gas turbine fuels. E. J. C.

404. Spark ignition—effect of molecular structure. H. F. Calcote, C. A. Gregory, Jr., C. M. Barnett, and R. B. Gilmor. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2656–62. Apparatus and procedure reported for investigating the minimum spark energy required for the ignition of sixty-three compounds, mainly organic. The compounds included saturated and unsaturated paraffins, aromatic compounds, cyclic compounds, substituted alkyls, ethers, ketones, esters, aldehydes, thioethers, peroxides, and four inorganic compounds. Tabulated and graphical data are given. E. J. C.

405. 2-6 di-tert-butyl-4-methyl phenol as a gasoline antioxidant. M. C. K. Jones, A. R. Jones, and B. P. Strickland. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2721–5. A study was made of the above hindered phenol as an antioxidant in aviation and motor gasolines, and in stabilizing TEL fluid. The compound is chemically inert, insoluble in water, highly soluble in gasolines, and resistant to oxidation. Tests showed it to be an effective antioxidant in leaded aviation fuels, a purpose for which it is now being used, but its effectiveness in motor gasolines was variable. E. J. C.

406. Composition of gasoline from coal hydrogenation. J. Feldman and M. Orchin. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2852–6.—The gasoline fraction of the feed to the vapour-phase stage of coal hydrogenation and the vapour-phase product were examined by a combination of methods in order to identify constituents. For example, the vapour phase product contained 58% as C_6 to C_8 hydrocarbons, 50% of which were naphthenic, 31% aromatic, and the remainder paraffinic. E. J. C.

407. Effect of fuel characteristics on vapour lock. O. C. Bridgeman. *Oil Gas J.*, 1.12.52, **51** (30), 127.—An analytical method is given for the correlation of vapour-lock test data for the interpretation of these data in terms of fuel-system characteristics, and for the evaluation of the relative vapour-locking characteristics of different types of fuel. G. A. C.

408. Road-test assessment of fuels. F. Kneule. *Erdöl u. Kohle*, 1952, **5**, 638–43.—U.S. work on road-tests (Uniontown, borderline) is discussed and significance of "sensitivity" (*i.e.*, difference between O.N. as determined by Research and Motor methods) explained. Increasing importance of Research method is confirmed in Germany. Desirability of an objective knock-detecting method in road-tests, in place of aural impressions, is stressed, and use of electro-acoustic method (no details given), whereby sound impulses from engine are amplified, filtered, and displayed on oscillograph screen, is recommended; same procedure could then be used for both single-cyl lab tests and road trials. V. B.

409. Patents. U.S.P. 2,596,198 (France 8.7.49; 13.5.48). A. Bègue. Motor fuel comprising gasoline, methyl, and/or ethyl alcohol, and 0·1 to 0·5 cc of glycocholic acid, taurocholic acid, or alkaline salts thereof to lower the surface tension.

U.S.P. 2,597,205 (22.12.49; 20.5.52). T. B. Tom, assr to Standard Oil Co. Hydrocarbon oil distillate containing a sulphur compound corrosive to copper is rendered non-corrosive by adding 0·005 to 1 wt % of olibanum.

U.S.P. 2,595,789 (29.7.50; 6.5.52). J. B. Hinkamp and R. Sugimoto, assrs to Ethyl Corpn. Diesel fuel containing a minor proportion of a lower saturated aliphatic nitramine to decrease the ignition delay period.

U.S.P. 2,597,475 (9.3.49; 20.5.52). A. L. Grisé, assr to Gilbert & Barker Manufacturing Co. Separator for removing water, and if desired, air, from gasoline, adapted to be inserted in a pipeline, comprising a tank having a hollow cylindrical member with its axis horizontal and containing a series of cylindrical rolls of fine metal fabric placed end to end in abutment and with their peripheries closely fitting the wall of the cylinder.

U.S.P. 2,597,754 (16.8.50; 20.5.52). H. Shapiro, assr to Ethyl Corpn. Preparation of $PbEt_4$ by comminuting Na–Pb alloy to 100 to 300 mesh particle size while submerged in excess EtCl at below reaction temp, then warming the resultant slurry to 40° to 100° C for a residence time of 3 to 30 min while maintaining a ratio EtCl : Pb of 0·5 to 6·25 : 1. J. M. S.

Gas Oil and Fuel Oil

410. Nitrogen compounds in domestic heating oil distillates. R. W. Sauer, F. W. Melpolder, and R. A. Brown. *Industr. Engng Chem.* (*Industr.*), 1952, **44,** 2606–9.—Carbazoles, indoles, pyrroles, quinolines, and pyridines were found to be present in amounts varying from 0·001 to 0·1% in a cat cracked distillate and a virgin Kuwait distillate. E. J. C.

411. Petroleum ash components and their effect on refractories. M. C. K. Jones and R. L. Hardy. *Industr. Engng Chem.* (*Industr.*), 1952, **44,** 2615–19.—Analyses of ashes from various crudes are given, and the effect of these ashes on refractories discussed. Alkaline earth and alkali metals lower the fusion point of refractories, but when vanadium is present the ash is much more destructive. E. J. C.

412. Cyclic sulphides in a petroleum distillate. R. H. Brown and S. Meyerson. *Industr. Engng Chem.* (*Industr.*), 1952, **44,** 2670–3.—The 165° to 280° C fraction of a high sulphur virgin distillate was examined to identify odiferous sulphur compounds other than mercaptans, by treating the spent acid after sulphuric acid treatment with mercuric chloride and subsequently fractionating by distillation at a reduced pressure. Mass spectra of fractions of the concentrate obtained showed the presence of mono-, di-, and tricyclic sulphur compounds. E. J. C.

413. The Fuel Research Board and oil problems. Anon. *Petrol. Times,* 1952, **56,** 1111.—The 1951 report is reviewed, and contains a considerable amount on solid fuels. Work on changes in structure which lead to alterations in viscous properties has been started. Examination was also made of methods for removing sulphur from residual fuel oils. G. A. C.

414. Effect of fuel additives on deposition of ash from oil. P. T. Sulzer. *Schweiz. Arch. angew. Wiss.*, 1952, **18,** 379–80.—Preliminary note. Tests made on gas turbine : operating pressure 1·5 atm, air ratio 3·2, blade temp 660° C, fuel flow 125 kg/hr, test duration 24 hr. Fuel had 1·9% S, 0·05% ash, 0·03% V_2O_5, 0·01% Na_2O. Photographs show marked improvement in cleanliness using 0·12% SiO_2, in oil-sol form (deposit reduced from 146 g to 1 g) or 0·12% Al_2O_3 (suspension), together with organic surface film (deposit reduced from 37 g to 0·8 g). V. B.

415. Patents. U.S.P. 2,597,901 (31.8.50; 27.5.52). W. C. Riddell and G. B. Kirk, assrs to Henry J. Kaiser Co. Water-repellent gypsum wallboard having a core disposed between fibrous liners, the core comprising a set mass of gypsum crystals coated with calcium rosin soap (1·0 to 2·0 wt % on dry basis) and residual fuel oil (5 to 10 wt % on dry basis).

U.S.P. 2,595,759 (30.11.48; 6.5.52). B. O. Buckland and D. C. Berkey, assrs to General Electric Co. Atomizing nozzle for spraying viscous liquids in which a vortex type liq spray nozzle is provided with a central pintle co-operating with the conical

sheet of liq produced by the spray orifice to define an annular atomizing gas orifice so that a sheath of high velocity gas is brought into intimate contact with the conical sheet of liq, the rapid acceleration of gas at this point serving to disrupt the sheet of liq and start the atomizing process.

U.S.P. 2,597,787 (26.5.47; 20.5.52). C. M. Garner and W. J. Allan, assrs to Automatic Control Corpn. Safety fuel cut-off mechanism for use with fluid fuel burners which is actuated by a change in the pressure differential in a pair of fluid filled elements arranged to absorb heat at different rates from the burner and in which one of the elements has greater fluid capacity than the other in order to maintain a minimum differential in working vol at high ambient temp which tend to equalize their temp and therefore the pressures of the fluids.

U.S.P. 2,596,944 (17.3.48; 13.5.52). R. Shellenberger and A. J. Poole, assr to Babcock & Wilcox Co. In a furnace burner utilizing fluid fuel in which non-combustible fluid is forced through the burner nozzle to purge it of residual fuel and foreign matter, mechanical interlock means are provided preventing the introduction of fuel before purging.

U.S.P. 2,595,999 (23.11.43; 6.5.52). S. Way, A. E. Hershey, and J. R. Boyd, assrs to Westinghouse Electric Corpn. Power plant combustion apparatus for heating compressed air to provide high velocity motive fluid, in which the combustion chamber walls are apertured. J. M. S.

Lubricants

416. Low-temperature lubrication of aircraft engines. S. Barron. *SAE quart. Trans.*, Apr. 1952, **6** (2), 175–85.—The development of conditions calling for special attention to low-temp lubrication are noted, and the provision of facilities for such investigation in the U.S. indicated. In the case of reciprocating engines, the aim has been to eliminate the need for large quantities of preheated air for starting. This is being accomplished by the development of improved equipment and new starting techniques. With regard to jet engines, oils of lower pour point, together with the adoption of the closed circuit oil system, are expected to meet all likely demands. Problems connected with oil dilution figured largely in the discussion. J. G. H.

417. Coal mine lubrication. C. W. Thompson. *Lubric. Engng*, Aug. 1952, **8** (4), 174–6. The effective operation of underground mining equipment calls for a planned lubrication schedule and individual consideration of the various types of equipment used. The special requirements of tipple and washing equipment, cutting and loading machines, shuttle cars and mine cars, conveyors, locomotives, and fans are indicated, and stress is laid on care in the storage and handling of lubricants. J. G. H.

418. Development of a turbo-prop synthetic lubricant. L. D. Christenson. *Lubric. Engng*, Aug. 1952, **8** (4), 177–9, 197–200.—The development of the turbo-prop engine has resulted in demands on lubricants which single petroleum oils are unable to meet. These include an effective temp. range of −65° to +400° F and resistance to oxidation and thermal decomposition at temps in excess of 400° F. Data are presented of investigations with a dibasic acid ester in conjunction with certain additives; anti-wear and extreme pressure evaluation are dealt with in some detail, together with oxidation and corrosion stability studies. The latter included oxidation and corrosion tests using the Thin Film Oxidation and Silver Corrosion Test as developed at the Petroleum Refining Lab. of Penn. State College for testing the effectiveness of a number of additives, after which the lubricating qualities of the various blends were determined and engine tests carried out on the more successful blends. The fluid finally selected contained no E.P. additives because of their corrosive and sludge-forming action on certain metals. J. G. H.

419. Oil fog lubrication. D. G. Faust. *Lubric. Engng*, Aug. 1952, **8** (4), 183–5, 203–5.—Data are presented of an investigation of the fundamental properties of lubricating aerosols, attempting to establish a sound basis for the application of oil fog lubrication. A dispersion of the droplets of uniform size in air was employed, and details are presented of the generator used, and the special equipment developed for the measurement of aerosol particle size, for the production of oil fogs having stated

characteristics, and for the transmission of the fogs to the point of action and for their condensation there. J. G. H.

420. Lubrication and the load-carrying capacity of gears. E. T. Hutt. *Lubric. Engng*, Aug. 1952, **8** (4), 180–2, 201–3.—Details are presented of modifications in the design and manufacture of conventional gears, by which their load carrying capacity can be increased. The connexion between lubrication and gear failure is discussed, together with the hydrodynamic theory of gear lubrication and the functions of E.P. additives. The optimum oil supply is considered, together with the possibility of predicting gear performance under controlled conditions. J. G. H.

421. Practical filtration in small overseas power stations. R. M. Tong. *Sci. Lubric.*, Oct. 1952, **4** (10), 18–19, 22, 33.—The objects of oil filtration are noted and objections to h.d. oils, chemical filtration, and batch filtration in small power plants are briefly discussed. The steam and settlement system is described and its disadvantages noted. Other batch methods are indicated, together with some continuous methods of filtration. Further points discussed include the removal of fuel and water from oil, the prevention of fuel dilution, and the maintenance of oil coolers. J. G. H.

422. Bacterial decomposition of soluble-oil emulsions. W. Sonntag. *Lubric. Engng*, Oct. 1952, **8** (5), 234, 260.—Details are presented of difficulties experienced over a year with oil separation and black scum formation in the accumulator of a hydraulic press system, using a soluble oil emulsion, during periods when circulation was halted. Decomposition was found to be due to bacterial action by *sporovibrio desulfuricans* developing in the circulation system, and recommendations are put forward for bacterial elimination. J. G. H.

423. Fundamental knowledge of lubricating grease structure. B. W. Hotten. *Lubric. Engng*, Oct. 1952, **8** (5), 244–6.—The composition and functional requirements of greases are briefly described, and theories of the physical structures of greases are discussed with evidence in favour of the microcrystalline paste theory set out in detail. Variations in fibre structure with thickener composition are shown in electron micrographs, and changes in structure with temperature are discussed. The relation between colloidal structure and flow properties is considered, and correlations between structural and functional properties are indicated. J. G. H.

424. Dispensing characteristics of lubricating greases. R. F. Strohecker. *Lubric. Engng*, Oct. 1952, **8** (5), 247–50, 263–5.—The desirability of a knowledge of the dispensing characteristics in the complete development of greases is remarked, and details are presented of work on dispensing characteristics of some thirty greases over a given temp range in air-operated service-station pumps. The relationship between the lab conditions employed and actual vehicle shackle and fitting lubrication is discussed, together with the development of suitable failing conditions to interpret the test data. Factors affecting pumpability are considered, and the development of a method relating failing temps determined from actual pumping tests to failing temps as determined from ASTM Pressure Viscometer data are presented and shown to be satisfactory, with a high degree of accuracy. J. G. H.

425. Revised SAE transmission oils. Anon. *Sci. Lubric.*, Aug. 1952, **4** (8), 10.—Details are presented in tabular form of the revised SAE classification for transmission and axle lubricants. This includes a new SAE 75 grade for use where very low temps prevail, and provides a range from SAE 75 to SAE 250. J. G. H.

426. Additives—molecules of mystery. J. M. Nuttall. *Sci. Lubric.*, Aug. 1952, **4** (8), 11–15.—The functions of additives in improving the performance of lubricants and in making good deficiencies in the properties of base oils are described, and the main classes of additives are enumerated with notes on their mode of operation. J. G. H.

427. New chain lubricator. Anon. *Sci. Lubric.*, Aug. 1952, **4** (8), 16–18.—A description of the new Radford Chain Lubricator marketed by Snowdon, Sons & Co. Special features include split-second timed injection, intermittent link lubrication, and ease of dismantling. J. G. H.

428. Animal and vegetable oils, fats and waxes. 4. Testing. C. Griffiths. *Sci. Lubric.*, Aug. 1952, **4** (8), 19–24.—Tests briefly described include acid value, ester value, iodine value, acetyl value, fatty acids, resin, Polenske value, insoluble bromides (fatty acids), determination of melting and solidifying points, determination of water and glycerol, and colour tests. J. G. H.

429. Animal and vegetable oils, fats and waxes. 5. Textile oils. C. Griffiths. *Sci. Lubric.*, Sept. 1952, **4** (9), 26–8.—The function of textile oils in manufacture is briefly indicated, and the use of sulphated oils is discussed. The special requirements for silk, wool, carpet yarns, cotton, artificial silk, and jute manufacture are summarized. J. G. H.

430. Lubrication of ball and roller bearings. Anon. *Sci. Lubric.*, Sept. 1952, **4** (9), 12–15.—The development of antifriction bearings is briefly surveyed, and the causes of friction in such bearings are described, together with the special features of needle bearings, corrosion of bearings, reasons for lubrication, and functions of the lubricant, with special emphasis on heat dissipation. J. G. H.

431. New multi-purpose multi-functional additive. Anon. *Sci. Lubric.*, Sept. 1952, **4** (9), 33–4.—Details are presented of Z.145D, marketed by H. W. Webber of Highbridge, Somerset. J. G. H.

432. Load-carrying capacity of bearings. C. J. Vogt. *Automot. Industr., N.Y.*, 15.8.52, **107** (4), 42–5, 76, 78.—The load-carrying capacity of a journal bearing operating under a fixed set of conditions is limited by the elasticity of the journal material at high l/d ratios due to oil film rupture at the end of the bearing. Low l/d ratios reduce load-carrying capacity through excessive oil leakage at the ends of the bearing. Minimum film thickness is determined by the bearing and journal surface finishes. Circumferential oil groves reduce the load-carrying capacity regardless of the l/d ratio of the bearing. J. G. H.

433. Bearings, lubricants, and lubrication. A digest of 1951 literature. Anon. *Mech. Engng, N.Y.*, Nov. 1952, **74** (11), 885.—A bibliography of 137 papers covers the following subjects: bearings and bearing materials, automotive lubricants, metal-working lubricants, boundary lubrication, and properties of lubricants. T. T.

434. Oxidation characteristics of lubricating oils at high temperatures. H. Diamond, H. C. Kennedy, and R. G. Larsen. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1834–43.—Oxidation characteristics of aircraft lubricating oils were determined in the region 220° to 270° C using an apparatus in which the oil was oxidized in a fairly thin layer by pure oxygen. The thicker the oil film, the less time it took for a given vol of oxygen to be absorbed per unit area of film. Increasing the temperature increased the rate of oxidation, as did the use of metals as catalysts. The addition of copper naphthenate (up to 100 p.p.m. as metal) progressively increased the rate of oxidation, but above that figure (up to 10,000 p.p.m.), the rate of oxidation of the oil decreased at a given temperature. Iron naphthenate progressively increased the rate of oxidation, while lead naphthenate had little effect up to about 1000 p.p.m., when there was a very marked increase in rate of oxidation, followed by a sharp fall as the concentration was increased to about 4000 p.p.m. E. J. C.

435. Liquid phase hydrocarbon oxidation. E. R. Booser and M. R. Fenske. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1850–6.—Pure hydrocarbons believed to be present in the lubricating oil fractions were subject to oxidation at 720 mm and 110° to 190° C, using commercial oxygen, with and without the addition of metal catalysts (iron or copper wire). Hydrocarbons studied included hexadecane, tetra*iso*butane, *cis*-decalin, 1-hexadecene, 1-methyl-4-*iso*propylbenzene, 1-methylnaphthalene, phenanthrene, as well as some mixtures, and a lubricant. Results showed that different types of hydrocarbons varied widely in their rates of oxidation. Generally, the aromatic compounds tended to oxidize with very small induction periods, in contrast to the larger periods of induction experienced with paraffins and naphthenes. Temperature always increased the rate of oxidation, but the use of copper and iron catalysts gave varied results. Tabulated and plotted data. E. J. C.

436. Molecular structure and properties of lubricating oil components. J. G. Lillard, W. C. Jones, Jr., and J. A. Anderson, Jr. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2623–31.—Effects of lube oil refining methods on quality are based primarily on empirical correlations of data from various routine physical properties measurements. A fundamental approach to the refining problems requires a knowledge of molecular structure of the lube oils, but such information has been largely lacking in the past. In the present work, which is part of a long-range programme, several wax-free lube oil samples covering a wide boiling range and derived from different crudes have been separated into concentrates of various compound types by silica-gel percolation. Narrow fractions of the percolates were characterized by measurements utilizing refractive index, carbon–hydrogen ratio, viscosity, ultra-violet and infra-red spectra. Data indicate lubes to be composed primarily of paraffin–naphthenes, naphthalenes, condensed naphthenes, aromatic naphthenes, and higher aromatics. Techniques developed will be useful for characterizing any lube stocks, and have been shown by example to be useful for following the solvent action of phenol extraction. (Authors' Abstract.) E. J. C.

437. High molecular weight polymers from propylene and 1-butene. C. M. Fontana, R. J. Herold, E. J. Kinney, and R. C. Miller. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2955–62.—A semi-batch process for the polymerization of the above hydrocarbons is described. An aluminium bromide catalyst was used at temperatures in the range −20° to −60° C. Continuous polymerization of propylene is also described. Products of the process, especially the polypropylenes, were shown to be effective V.I. improvers for motor oils. A mechanism of the process is also proposed. E. J. C.

Bitumen, Asphalt, and Tar

438. Patents. U.S.P. 2,595,465 (24.11.44; 6.5.52). H. B. Keene, D. A. Anderson, and P. H. Aldrich, assrs to Minnesota Mining and Manufacturing Co. Production of coloured roofing granules of improved anchorage in asphalt coatings by coating base granules with a coloured composition containing sodium silicate, converting the silicate to silica at > 600° F and applying a hydrocarbon solution of an alkyl, aryl, alkoxy, or aryloxy silicane having < 1 readily hydrolysable inorganic radical attached to Si.

U.S.P. 2,596,323 (11.6.48; 13.5.52). A. G. Asaff, assr to Commonwealth Laboratories. To a sticky, non-trowelable mastic comprising aggregate and a solution of asphalt in a solvent comprising 25 to 50% benzene, toluene, or xylene, and 50 to 75% of a lower aliphatic acetate ester, is added sufficient alcohol to cause a two-phase separation and render the mastic cohesive, plastic, non-sticky, and trowelable and suitable for use in producing flooring, etc.

U.S.P. 2,597,996 (14.6.49; 27.5.52). R. A. Johnson, assr to Pittsburgh Corning Corpn. Adhesive for assembling rigid non-load-bearing insulation materials and having permanent masticity, vapour tightness, and resistance to cold flow at normal temp comprises, in parts by weight, asphalt 4 to 6, coumarone–indene resin 6 to 4, microcrystalline wax 1·5 to 1, 40% chlorinated paraffin wax 7 to 2. J. M. S.

Special Hydrocarbon Products

439. Cutting oils, types, designation, and suggested symbols. O. W. Boston. *Sci. Lubric.*, Aug. 1952, **4** (8), 25–6.—A list of tentative definitions and symbols prepared by the Research Committee on Cutting Fluids of ASTM and ASME. J. G. H.

440. Patents. U.S.P. 2,594,183 (29.5.51; 22.4.52). I. T. Krohn and H. Shapiro, assrs to Ethyl Corpn. Making hydrocarbon–lead compounds by reacting a Ca–Pb alloy (1 to 1·5 : 1 Ca–Pb ratio) with an alkylating agent having a negative radical which reacts with Ca.

U.S.P. 2,594,225 (29.5.51; 22.4.52). H. Shapiro and I. T. Krohn, assrs to Ethyl Corpn. Making hydrocarbon–lead compounds by reacting a Ca/Pb alloy (2·2 to 3·5 : 1 Ca–Pb ratio) with an alkylating agent having a negative radical which reacts with Ca.

U.S.P. 2,595,158 (9.6.49; 29.4.52). C. F. McCue and W. E. J. Broom, assrs to Standard Oil Development Co. Rust preventing composition comprising microcrystalline wax suspended in a solvent containing a corrosion inhibitor. R. C. R.

Derived Chemical Products

441. The petroleum-chemicals industry in the U.K. H. K. Whalley. *Inst. Petrol. Rev.*, 1952, **6**, 353.—The historical development of the petroleum chemicals industry in the U.K. and in the U.S. is traced and comparisons made. The main differences in the industry in the two countries are due to the following main reasons :—

(1) There are no significant natural gas or oil resources in the U.K.
(2) The U.K. market differs in size and pattern from that of the U.S.
(3) U.K. developments are substantially " British " rather than international.

The four main U.K. producing companies are described and their processes and main products indicated. Together they represent £40 million capital investment, and annual throughput will be between 500,000 and 800,000 tons. It is estimated that production will include 35,000 tons p.a. of ethyl alcohol, 10,000 to 20,000 tons p.a. of chlorinated solvents from ethylene, 30,000 to 40,000 tons p.a. of ethylene oxide, 16,000 tons p.a. of monostyrene, 60,000 to 70,000 tons p.a. of *iso*propyl alcohol, acetone, and their derivatives, and approx 10,000 tons p.a. of C_4 derivatives. R. H.

442. Cresylic acids in petroleum naphthas. S. G. Gallo, G. S. Carlson, and F. A. Biribauer. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 2610–15.—Increasing demand for cresylic acids, particularly C_6 to C_8 phenols, stimulated on appraisal of catalytic petroleum naphthas (C_5 to 400° F) as a source for additional quantities of these materials. Naphthas from seven fluid cat crackers were assayed for these compounds, and results compared with similar assays of thermal naphthas. Cresols, xylenols, and phenol were found to be present in decreasing order of abundance. Impurities, such as thiophenols, were removed from the cresylic acids by air blowing, distillation, limited neutralization, or a combination of these methods. The products are similar to those obtained from coal tar. E. J. C.

443. Paley Commission Report on coal and petroleum chemicals and products. Anon. *India Rubb. World*, 1952, **126** (6), 777 ; **127** (1), 70.—The first part of the article gives some extracts of the relevant chapters of the Paley Commission Report. Topics discussed include past and present trends in cyclic finished products, the growth of plastics, synthetic cyclic surface-active agents and insecticides, chemicals from acetylene, and expected production and requirements.

The second part reviews the position in more detail from the petroleum aspect. Within the last twenty-five years hydrocarbons from petroleum and natural gas have become a source of raw materials for more than 2500 different chemical products. Despite increasing demands, ultimate reserves of hydrocarbons appear adequate. The quantities of hydrocarbon intermediates available for chemical conversion during the period 1950–75 are estimated. The likely usages of methane are outlined, and it is shown how, for many ethylene-based products, demand exceeds supply, and may continue to do so for many years. The outlets and future trends for other olefin-based chemicals are discussed.

As regards aromatics, the main end-products from benzene are, in decreasing order of importance, styrene, phenol, nylon, aniline, detergents, insecticides, such as DDT and benzene hexachloride, maleic anhydride, etc. Toluene finds a new use in plastics, since vinyl-toluene is a partial substitute for styrene in synthetic rubber, emulsion paints, and plastics. C_8 aromatics are used as aviation gasoline components and for making synthetic fibres. The position as regards polycyclic aromatics is also discussed. C. N. T.

444. Petroleum chemicals at Wilton. Anon. *Industr. Chem. Mfr.*, 1952, **28**, 497–502.—At Wilton (Tees-side) works of I.C.I. Ltd. olefine production by pyrolysis of pet dist commenced in 1951. Principal olefines required are ethylene and propylene, and light paraffinic dist with high H–C ratio, was selected to give optimum olefine yields. Capacity of pyrolysis plant 50 to 75 million gal/year, and residue from process (petrol) varies with operating conditions from one-third to two-thirds of this amount. Designed outputs of ethylene and propylene are 30,000 tons/year each. Essential feature of olefine production lies in supply of heat to oil vap at elevated temp by mixing with steam at still higher temp. Pyrolysis takes place at about 700° C in soaker lines, mixture then quenched by giving up heat to waste-heat boilers.

Gas separation plant splits pyrolysis mixture after primary fractionation into six streams, viz., tail gas (H_2 and CH_4), high-purity ethylene, ethane, propylene–propane, butylenes/butadiene and crude debutanized petrol. Tail gas mainly converted at Billingham to synthesis gas for NH_3 production. Ethylene at present mainly used for polymerization to polythene; remainder used for making ethylene oxide, which in turn is used for ethylene glycol production and also for Lissapol N (liquid detergent) by linking with alkyl phenols. Ethylene glycol also one raw material for Terylene fibre, other raw material *p*-xylene due for production shortly. Propylene is raw material for *iso*propanol (by direct hydration) and acetone, latter used for manufacture of Perspex (methacrylate plastic). C_4 stream now used for fuel or petrol at Billingham, but butadiene content considerable and its extraction is planned. Photographs of plants given. A. C.

Coal, Shale, and Peat

445. Pyrolysis of coal and shale. C. H. Prien. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2064–72.—Annual review covering 300 references. E. J. C.

446. Composition of crude shale oils. G. U. Dinneen, J. S. Ball, and H. M. Thorne. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2632–5.—Analyses of nineteen shale oils from seven different countries are given. E. J. C.

447. Composition of shale oil. W. E. Cady and H. S. Seelig. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2636–41.—A shale oil obtained from distilling an American shale in an N.T.U. retort was examined by distillation, extraction with acid metal chloride, silica-gel percolation, urea extraction, and infra-red spectrometry. Oil consisted of 39% hydrocarbons and 61% of nitrogen, sulphur, and oxygen compounds. Difficulties of processing such a mixture to give high quality petroleum products are pointed out. E. J. C.

448. High temperature shale oil. F. E. Brantley, R. J. Cox, H. W. Sohns, W. I. Barnet, and W. I. R. Murphy. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2641–7.—Experiments were carried out in a vertical tube retort for distilling crushed shale at temperatures from 1200° to 1800° F. It was found that aromatic content of the oil increased with retorting temperature. At 1700° F the neutral naphtha fraction of the oil was almost 100° aromatic. Tabulated data is compared with that on shale oils produced by lower retorting temperatures. E. J. C.

449. High temperature shale oil. Production composition. G. U. Dinneen, J. R. Smith, and C. W. Bailey. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2647–50.—Fractional distillation, adsorption, spectrometry, and other techniques were used to establish the composition of high temperature shale oil prepared as described in the previous abstract. E. J. C.

450. Water-soluble polycarboxylic acids by oxidation of coal. N. W. Franke, M. W. Kiebler, C. H. Ruof, T. R. Savich, and H. C. Howard. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2784–92.—A pilot plant, experimental procedure, and results obtained are reported for the production of aromatic acids from coal. E. J. C.

451. Contribution to the question of hydrocarbon recovery under pressure. E. Schon. *BrennstChemie*, 1952, **33** (13–14), 227–31.—Use of the total coke oven gas output as transport gas and hydrocarbon by-product recovery under transport gas pressure are considered. Separate plant designs are presented, and their operation for max economy discussed with tabulated data. A final composite drawing with explanatory legend shows the design of a complete high-pressure plant for hydrocarbon recovery. Summarized results indicate the comparative values obtained for the various processes referred to normal pressure. With const delivery of 100% scrubbed transport gas, price reduction is 8 to 10%, with 50% delivery 10 to 15%. R. T.

Miscellaneous Products

452. The water pollution problem—get ready to tackle it. M. Nord. *Petrol. Refin.*, **31** (10), 125–30.—During the past decade the problem of water pollution has become acute in the United States. The effects and tolerances of contaminants are sum-

marized. Biochemical oxygen demand is the main criterion of pollution, and its significance is discussed. Methods of tackling water pollution problems in refineries and the legal position are outlined. A. R. H.

453. Products from hydrocarbon synthesis. C. E. Morrell, C. S. Carlson, J. H. McAteer, R. F. Robey, and P. V. Smith, Jr. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 2839–43.—A summary of work which has been carried out on the synthesis of hydrocarbons and oxygenated compounds from carbon monoxide and hydrogen mixtures. A more detailed presentation of work relating to the separation and purification of the oxygenated compounds is given, together with some typical analyses of fractions. E. J. C.

454. Glass fibre in plastics. A. M. Dobson. *Auto. Engr*, Dec. 1952, **42** (561), 543.—Characteristics of various types of glass cloth are listed, and their suitability for various applications is discussed. Methods of cloth treatment prior to bonding, and the construction of diamond and coiled mats are described. T. T.

455. Modern glass cleaners. M. A. Lesser. *Soap, N.Y.*, Sept. 1952, **28** (9), 46.—The various types of glass cleaners and anti-misting compositions are surveyed. Typical formulæ are quoted. Thirty-four literature references are included. M. V. J.

456. Synthetic detergents up to date, III. J. W. McCutcheon. *Soap, N.Y.*, Sept. 1952, **28** (9), 53.—This is Pt III of a series listing synthetic detergents by trade name. Manufacturer, chemical composition and per cent concentration, physical form, and main uses are given. M. V. J.

457. Household insecticides . . . their role in public health. J. M. Andrews. *Soap, N.Y.*, Sept. 1952, **28** (9), 135.—The development in control of malaria mosquitoes since 1897 is reviewed briefly to explain the author's conviction that among the various factors contributing to the decline in prevalence of malaria the use of household insecticides is significant. Examples are quoted of the use of DDT against insect vectors of various diseases. The problem of insect resistance to insecticides is stressed and discussed. A table showing current world status of insecticide resistant insects is included. Thirty-two literature references are included. M. V. J.

458. A method for determining pressure and consistency of aerosol coatings. R. W. Morrow and F. S. Palmer. *Soap, N.Y.*, Sept. 1952, **28** (9), 139.—An apparatus and its method of use for determining pressure and consistency of aerosol formulations is described. The apparatus incorporates a falling body type of viscometer. M. V. J.

459. Physical characteristics of white pigments with particular reference to titanium dioxide. W. Hughes. *J. Oil Col. Chem. Ass.*, Nov. 1952, **35** (389), 535.—The optical properties of white pigments are discussed, in particular hiding power and light absorption. These characteristics are governed by the refractive index of the pigment relative to the surrounding medium, particle size distribution, particle shape, and the impurities present. The scattering of light by fine particles in relation to tinting strength and hiding power is considered, as also are the absorption characteristics and effect of trace impurities with reference to tone and chemical activity. The way in which texture and particle shape characteristics are influenced by manufacturing methods is shown. There are twenty-five literature references. Discussion is appended. D. K.

Corrosion

460. Corrosion costs cuts promised in sour crude field. F. H. Clements and J. P. Barrett. *World Oil*, Oct. 1952, **135** (5), 264.—A review of methods as practised in the Midlands Farm field of Andrews County, W. Texas, for the control of corrosion due to hydrogen sulphide, electrolytic sources, and to the action of sulphate reducing bacteria. The whole project has been conducted with close consultation between field and laboratory. References. A. J. H.

461. Cathodic protection licks corrosion. L. C. Werkin. *Petrol. Refin.*, **31** (10), 122–4.—The use of cathodic protection offers extensive opportunity for reducing enormous losses by underground and underwater corrosion. A. R. H.

462. Corrosion control in water systems. H. H. Uhlig. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1736–40.—A survey of the methods available for combating corrosion is presented under the headings of cathodic protection, metallic coatings, organic coatings, inhibitors, alteration of environment, and metals and alloys. It is pointed out that there is still need for research into the problem, particularly with a view to obtaining a reliable, inexpensive, and non-toxic inhibitor for equipment handling water. Titanium is cited as a possible material for handling water when the price of the metal becomes cheaper. E. J. C.

463. Cooling water problems in the New York Metropolitan Area. S. Sussman. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1740–4.—In the region quoted combination of soft low alkalinity make-up water and heavy atmospheric contamination gives rise to a minimum of scaling and severe corrosion. Case histories are quoted and best results obtained using alkali for controls and chromates or silicates for passive film formation. E. J. C.

464. Effects of velocity on corrosion by water. H. R. Copson. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1745–52.—General effects of velocity on rate of corrosion are discussed. Review presented of available information with the emphasis on corrosion of iron, zinc, copper, and their alloys in water flowing at varying velocities. E. J. C.

465. Effect of temperature on corrosion of metals by water. N. Hackerman. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1752–5.—Reviews effects of temperature on corrosion of ferrous, non-ferrous, and coupled metals, mainly by water. Temperature dependent properties discussed include oxygen solubility, galvanic potentials, and precipitation rates. E. J. C.

466. Corrosion control with organic inhibitors. J. N. Breston. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1755–61.—An outline of mechanism, properties, and conditions of application of organic corrosion inhibitors. Their use in acid cleaning problems, cooling and refrigeration, steam generation, oil wells, and petroleum handling, etc., is indicated. E. J. C.

467. Inhibitors for eliminating corrosion in steam and condensate lines. R. C. Ulmer and J. W. Wood. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1761–5.—Describes experiments carried out to investigate effect of alkaline substances and film forming substances in combating steam and condensate corrosion of mild steel, copper, and brass. Data given in tabular and graphical form indicated that neutralization of acidity gave best results for mild steel. For any given case, selected treatment would depend on oxygen content of steam. E. J. C.

468. Action of sodium silicate as a corrosion inhibitor in water piping. L. Lehrman and H. L. Shuldener. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1765–9.—Experiments reported which were carried out to determine the mechanism by which protective films are formed on metals in contact with water to which sodium silicate was added. Existence of an equilibrium between ionic and colloidal silica was confirmed, and the rate of interconversion of these forms was shown to be rapid for concentrations of silica in the range normally used for water treatment. Shown that solid corrosion products must form on the pipe before silica is taken up. Zinc hydroxide took up silica by chemisorption, but cupric and ferric hydroxides and magnetite took up silica by a different mechanism. E. J. C.

469. Protection of metals against pitting, turberculation, and general corrosion. H. L. Kahler and P. J. Gaughan. *Industr. Engng Chem.* (*Industr.*), 1952, **44**, 1770–4.—Results of adding phosphate–chromate to water as a corrosion inhibitor are described for one chemical plant cooler and three oil refinery cooling systems. In all cases the results confirmed the prediction from pilot plant tests that the combined inhibitor was more efficient than either of the inhibitors separately. E. J. C.

470. Protective film formation with phosphate glasses. G. B. Hatch. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 1775–80, 1780–6.—Experimental method and results reported for investigation of formation of protective films of glassy phosphate on metals. E. J. C.

471. Cathodic protection of steel in contact with water. L. P. Sudrabin and H. C. Marks. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 1786–91.—The effects of dissolved oxygen concentration, temperature, velocity, mineral composition, surface films, and and coatings on the requirements of cathodic currents for protecting metals from corrosion by water are discussed. E. J. C.

472. Pitting corrosion characteristics of aluminium. P. M. Aziz and H. P. Goddard. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 1791–5.—Work described concerns the pitting of aluminium with and without the addition of magnesium and manganese by a fairly hard water. Results showed that with aluminium of 99·5 to 99·99% purity, the addition of small percentages of Mg and/or Mn (1 to 2%) gave reduced probability of pitting. E. J. C.

473. Corrosion resistance of titanium, zirconium, and stainless steel. L. B. Golden, I. R. Lane, Jr., and W. L. Acherman. *Industr. Engng Chem. (Industr.)*, 1952, **44**, 1930–9.—Tests carried out with above metals in contact with mineral acids, chlorides, and hypochlorites showed that titanium in particular was resistant to solutions of the alkaline and alkaline earth chlorides and hypochlorites. Zirconium was also resistant to chlorides, but the 20–29 Cr–Ni stainless steel was subjected to pitting with all salt solutions.

All metals were resistant to nitric acid. E. J. C.

474. Crude oil working tanks. R. M. Carter. *Oil Gas J.*, 8.12.52, **51** (31), 98.—The design, construction, operation, and maintenance of tanks for crude oil and importance of selection of type of tank and of foundations are discussed. G. A. C.

475. Patents. U.S.P. 2,596,273 (11.9.47; 13.5.52). M. I. Moyer and J. M. Hersh, assrs to Cities Service Oil Co. H_2S—corrosion of metal oil well equipment is inhibited by adding to an oil-well brine containing dissolved H_2S, at a point near a producing horizon of the well, a small proportion of the reaction product of 1 mol ethylene diamine with 2 mol formaldehyde. In U.S.P. 2,597,425 the reaction product of 1 mol monoethanolamine and 1 mol of formaldehyde is added.

U.S.P. 2,596,450 (28.10.46; 13.5.52). A. Wachter and N. Stillman, assrs to Shell Development Co. Coating material containing *ca* 10 wt % of an organic base nitrite as corrosion inhibitor.

U.S.P. 2,598,213 (1.9.49; 27.5.52). C. M. Blair, assr to Petrolite Corpn. Ltd. Compounds of the formula $ZZN(C_nH_{2n}NZ)_xZ$, wherein n is an integer from 2 to 10; x is an integer from 1 to 10; Z = H, RCO or D, RCO being a radical of a higher carboxylic acid which must occur at least once; R′CO is derived from a $<C_6$ carboxylic acid; D = alkyl, or aminoalkyl; the molecule containing at least one radical $—NH_2$, $–NHD'$, $–NHT–$, $–ND'T–$, $–NT_2–$, $–ND'_2$ wherein T = alkylene, D' = alkyl. For use in inhibiting corrosion of metals, particularly of equipment in contact with corrosive oils or oil–brine mixtures. J. M. S.

Engines and Automotive Equipment

476. Humphreys constant-compression engine. W. H. Paul and I. B. Humphreys. *SAE quart Trans.* Apr. 1952, **6** (2), 259–73.—The development of ideas directed towards the use of lower octane fuels in high-compression ratio engines as a means of increasing thermal efficiency is discussed, and details are presented of the Humphreys engine, a simple variable clearance volume unit, designed to provide high compression at part throttle and essentially the same compression pressure over the driving range. Performance and road tests of Wisconsin, Willys, and Oldsmobile engines fitted with the Humphreys unit are presented which substantiate the claims made and indicate the possibilities of future development. J. G. H.

477. Metropolitan-Vickers 15,000-kW gas turbine. Anon. *Gas Oil Pwr*, 1952, **47**, 206–7, 228–32.—The turbine comprises a fourteen-stage L.P. compressor, air inter-

cooler, fifteen-stage H.P. compressor, heat exchanger, main combustion chamber, H.P. turbine, reheat combustion chamber, and L.P. turbine. Air passes through the components in the order given.

The L.P. turbine, coupled to the L.P. compressor and the 15,000-kW generator, runs at a constant speed of 3000 r.p.m., and is a six-stage unit. The H.P. turbine is coupled to the H.P. compressor, and runs at 5500 r.p.m. at full load. The heat exchangers, inter-coolers, and combustion chambers are described in detail.

The fuel system is designed for the use of either distillate or preheated residual fuel. Pumps supply fuel at the rate of 1686 g.p.h. against a pressure of 1000 p.s.i., and the fuel system includes a number of safety devices designed to interrupt the supply if predetermined conditions are exceeded.

The article contains eighteen illustrations and diagrams. H. C. E.

478. Dual fuel power plant for important sewerage scheme. Anon. *Gas Oil Pwr*, 1952, **47**, 249–53.—The Colne Valley sewage disposal plant is independent of outside power supplies, despite the fact that extensive pumping of sewage is necessary. The power equipment comprises six National dual fuel BARUP engines, which each develop 666 b.h.p. coupled to 750-kVa 3300-V alternators, and this output is sufficient to meet normal demands. For peak periods two Holmes–Connersville blowers are arranged to supply air at 42 p.s.i. to a bus main, thus enabling any two engines to operate as pressure-charged units with a net output of 866 b.h.p.

Under normal conditions methane is obtained by anærobic digestion of sewage sludge at 85° F, and is supplied at 4 inches w.g. Fuel oil, stored in tanks of 6500 gal capacity, is delivered through filters and meters to separate service tanks for each engine. The usual gas–oil ratio is 10 : 1, and the engines are started by compressed air.

Two independent waste heat recovery systems are installed; low grade heat is obtained from the cooling water and high grade heat from the exhaust gases. The low grade heat circuit is used mainly for maintaining the sludge digestion tanks at 85° F, and the high grade heat circuit can be used to augment this supply, or for domestic heating at the works.

The electrical equipment is briefly described. The entire installation is controlled by a variety of automatic devices, chief of which is the temperature control on the heat input to the high grade heat circuit. H. C. E.

479. Sulzer two-stroke dual fuel engine. Anon. *Gas Oil Pwr*, 1952, **47**, 254, 259.—This converted unit has six cyl of bore and stroke 480 and 700 mm respectively, and develops 2100 b.h.p. at 250 r.p.m. when running on diesel fuel. The control gear for gas operation consists of two servo motors, one for liquid fuel and one for gas, operated by the oil pressure in the lubricating system. After starting in the usual way on liquid fuel, the gas valve is opened and the pressure acts on a relay which starts the gas servo motor and reduces the diesel servo motor to supply only 12% of the diesel fuel required for normal full load running. The gas is supplied at 35 to 40 p.s.i., and if the pressure drops below 35 p.s.i., the relay operates the servo motors to increase the supply of diesel fuel.

With methane as fuel the output is 85 to 90% of that obtained with diesel fuel. H. C. E.

480. Japanese small oil engines. Anon. *Gas Oil Pwr*, 1952, **47**, 260–5.—The Kubota four-stroke engines have magneto ignition, run on petrol–paraffin, and are hopper-cooled. The single cyl has dimensions which vary from 85 to 155 mm bore and 105 to 210 mm stroke, giving outputs from 2 to 10 b.h.p. at 750 to 550 r.p.m. In all five units are manufactured.

The Fulper horizontal four-stroke units have a single cyl of 110, 130, or 160 mm bore and 170, 220, or 250 mm stroke, and generate 6, 10, or 16 b.h.p. at 700, 600, or 500 r.p.m Heavy fuel is burned in an antechamber combustion head, and the C.R. is from 19 to 16 : 1. The fuel consumption lies between 0·41 and 0·445 lb/b.h.p.hr.

The Mitsubishi Daiya vertical four-stroke engine develops 8 b.h.p. at 900 r.p.m. in a single cyl of 110 mm bore by 150 mm stroke. The max output is 13 b.h.p. at 1250 to 1300 r.p.m., and the fuel consumption varies between 0·45 (11 b.h.p. at 1300 r.p.m.) and 0·61 (11·5 b.h.p. at 1100 r.p.m.) lb/b.h.p.hr. Lubrication is by gear pump, and the lub oil consumption is 5 g/b.h.p.hr.

Yanmar vertical engines cover the range from 3 to 65 b.h.p. with twenty four-stroke models, and are constructed for marine and stationary requirements. Single-cyl horizontal engines vary from 3 b.h.p. at 800 r.p.m. to 25 b.h.p. at 450 r.p.m. A two cyl unit developing 10 to 14 b.h.p. at 750 to 900 r.p.m., and a four cyl vertical rated at 130 b.h.p. at 450 r.p.m. are also built.

Ikegai Tateyama Seisakusho Co. Ltd. build two- and four-stroke marine engines as three-, four-, and five-cyl units. Cyl sizes are 200, 220, or 250 mm bore by 240 or 380 mm stroke, and the outputs are 25 and 40 b.h.p/cyl at 430 and 380 r.p.m. respectively.

The Daikin engine is constructed in two- to six-cyl units of cyl dimensions 200 mm bore and 280 mm stroke. It develops 25 b.h.p/cyl at 500 r.p.m., or 30 b.h.p/cyl at 600 r.p.m. Open combustion chambers are used in conjunction with multihole nozzles and monobloc injection pumps. The cyl heads are separate units, and each has a single inlet and exhaust valve; the valve gear is fully enclosed.

The above descriptions were obtained from manufacturers' pamphlets and not from a visual inspection of the engines. H. C. E.

481. Performance of the first Werkspoor-Lugt engine. Anon. *Mot. Ship*, 1952, **33**, 344.—This engine, a normally aspirated four-cyl, two-stroke, single-acting unit of cyl dia 600 mm and piston stroke 900 mm, was installed in a Great Lakes type ship of the Oranje Line. Since trials early in 1951 the ship has had 260 full-power sailing days, and the performance of the engine, running on residual fuel of viscosity 2634 sec R.I. at 100° F, is reported. U. M.

482. The new M.A.N. engine. Anon. *Mot. Ship*, 1952, **33**, 346.—Details are given of the evolution and design of the two-stroke single-acting engine with a continuous rating of 900 b.h.p/cyl. After-charging system of scavenging is employed, and engine is modified to run on boiler oil. U. M

483. New method of preventing corrosion. Anon. *Mot. Ship*, 1952, **33**, 362.—Developed by Peradin and Watercraft Ltd. (a division of P.B. Cow Ltd.), this method of eliminating or reducing corrosion of cast iron or steel engine components and structures on board ship consists of the application or painting on of a layer of Peratol—a rubber-like plastic and self-vulcanizing paint. The method is at present under test as a treatment for external surface of cyl liners of marine diesel engines to prevent erosion. U. M.

484. A French axial-flow gas turbine. Anon. *Aeroplane*, 28.11.52, **83** (2158), 718.—A fully illustrated description is given of the Atar 101 produced by the Société Nationale d'Etude et de Construction de Moteurs d'Aviation (SNECMA). Work on the design started in 1947; it was developed from the German B.M.W. 003 and designed to have a thrust at take-off of 3750 lb. Since then it has been developed to give a thrust of 6170 lb, and at this rating is in the pre-production stage. The engine, of conventional design, consists of a seven-stage axial-flow compressor, an annular combustion chamber, and a single-stage turbine. German influence is shown in the exhaust cone assembly, the exhaust nozzle being variable in area by movement of the inner cone. A pressure ratio of approx 4·5 : 1 is obtainable from the compressor at maximum r.p.m. Officially observed 15-hr tests have been performed at 5730 lb and 6170 lb ratings, and further tests made at 6615 lb. The optimum value of specific fuel consumption obtained has been 0·96 lb/lb/hr. U. M.

485. Dowty's spill-flow system for turbines. Anon. *Aeroplane*, 5.12.52, **83** (2159), 747.—Dowty's spill burner is similar to the ordinary Simplex type in having tangential ports leading into a chamber in which the fuel is given a swirl velocity before leaving the final orifice, but differs in that the spill burner has an annular orifice at the back of the swirl chamber through which a controlled spill of fuel takes place. Its unique characteristic is that the velocity energy available for atomization is independent of burner output, and so a burner can be designed which will give satisfactory atomization down to less than 1% of its maximum flow. Atomization even improves at low flows, which is an advantage at high altitude, when burner output is much reduced. By spilling fuel from the back of the swirl chamber the burner can be supplied continuously with fuel at a high rate of flow; the proportion of this fuel that is spilled back is inversely proportional to r.p.m. The system requires no moving parts with fine clearances for controlling flows, so that manufacturing tolerances are larger and production methods

more simple than with previous types. A full description of the system is given, illustrated by coloured diagrams. U. M.

486. Vehicle performance. A method of determining drag, engine power output, and transmission behaviour under operating conditions. Z. Arkus-Duntov. *Auto. Engr*, Dec. 1952, **42** (561), 535.—Road tests of the Allard J2X competition model were carried out at the MIRA proving ground at Lindlez. Max speed of car could not be attained at this site, and a system of calculation, based on timings over two successive traps of 50 ft length, was developed. Full details of the method, and results of the tests, are given. T. T.

487. Facts and possibilities concerning the industrial gas turbine. Pt I. H. W. van Tijen. *Ingenieur, 's Grav.*, 21.11.52, **64** (47), W101–12.—For the most simple gas turbine cycle, a comparison is made between the results of an elementary calculation and of a calculation taking into account the various component losses. Graphs are given, showing the influence of compression ratio, compressor inlet temperature, and turbine inlet temperature on thermal efficiency, mass flow, and work ratio. The influence of regenerator efficiency and regenerator pressure losses on thermal efficiency, mass flow, work ratio, and regenerator heating surface are discussed, and represented graphically. The present position of the industrial gas turbine is compared with that of some typical steam installations, and future possibilities are mentioned. A concluding paragraph explains that the linear dimensions and the heating surfaces of the tube bundles of recuperative regenerators with given pressure losses for gas turbines are also dependent on the chosen ratios of these linear dimensions. The method of calculation used in connexion herewith is given in an appendix. (Author's Abstract.) G. F. T. C.

488. Patents. U.S.P. 2,595,932 (Switz. 20.7.46; 6.5.52). G. Eichelberg, assr to Ges. zur Forderung der Forschung an der Eidg. Technischen Hochschule, Zurich. Method of scavenging a two-cycle engine cylinder by simultaneously opening both inlet and exhaust piston-controlled ports after combustion so that the combustion products flow into the inlet and exhaust pipes. In the inlet pipe the pressure wave is reflected back from closed non-return valves situated therein and reaches the cylinder when the pressure therein has been relieved through the exhaust pipe, the reduced pressure causing the non-return valves to open and scavenging air to be drawn in.

U.S.P. 2,598,147 (30.12.49; 27.5.52). G. L. Tescher, assr to Tescher Corpn. Fuel feeding system for I.C. engines in which a fuel pump operated by alternating positive and negative pressures in the crankcase is provided with a spring biased by-pass valve whereby excess fuel pressure at the outlet of the pump is relieved to the inlet side to prevent accumulation of excessive pressures in the carburettor.

U.S.P. 2,598,202 (29.5.47; 27.5.52). E. O. Wirth and F. Barfod, assrs to Bendix Aviation Corpn. System for supplying liquid fuel under superatmospheric pressure to an I.C. engine, in which the fuel is metered by varying the oil pressure in accordance with engine speed both upstream and downstream from a variable size metering orifice, an idle cut-off mechanism preventing discharge of fuel while the engine is inoperative, irrespective of the absolute fuel pressure of the system.

U.S.P. 2,596,644 (10.12.46; 13.5.52). E. B. Bradford, A. Africano, and C. N. Hickman, assrs to U.S.A. (Secretary of War). A jet propulsion device in which the motor casing has a rearwardly directed discharge orifice to which a Venturi nozzle is attached. This nozzle extends sufficiently to reduce the flash occurring on secondary ignition of the discharged propellent fluid and is attached by means including a low m.p. metal, which at a predetermined temp rise in the casing melts and releases the nozzle.

U.S.P. 2,597,582 (14.10.49; 20.5.52). G. A. Gruss, assr to U.S.A. (Secretary of the Army). Fuel valve for use on a jet-propelled rotary air foil in which the effect of centrifugal force on a column of mercury is used to offset the effect of centrifugal force on fuel going to the blade tips.

U.S.P. 2,595,524 (19.7.45; 6.5.52). C. O. Henneman and D. R. de Boisblanc, assrs to Phillips Petroleum Co. Control apparatus for an I.C. engine comprising a detonation meter for producing a voltage representative of the average knock intensity in a cylinder, and means controlled by the amplitude of the voltage to move a lever

regulating an operating variable of the engine when the amplitude falls below a first predetermined value or rises above a second predetermined value. J. M. S.

Safety Precautions

489. Fire Research Board Report for 1951. Anon. *Petrol. Times*, **56**, 1114.—The effect of storage on foam components, foam "figure of merit" in practice, and inflammability of gas are among points dealt with in review of the D.S.I.R. Report. G. A. C.

490. The Avonmouth fire ; Report by I.P. Engineering Sub-Committee. *Inst. Petrol. Rev.*, 1952, **6**, 400.—On 6 Sept. 1951 a serious fire occurred at Avonmouth, which lasted for 38 hr and caused two deaths. The fire started with an explosion while a tanker was unloading a cargo of motor spirit and gas oil. 13,000 tons of motor spirit and 2050 tons of gas oil were involved. The salient points of the report of H.M. Chief Inspector of Explosions, Dr H. E. Watts, are summarized, and the observations thereon of the I.P. Engineering Sub-Committee recorded. R. H.

491. Electrical installation. B. Z. Segall. *Oil Gas J.*, 24.11.52, **51** (29), 141 ; 1.12.52, **51** (30), 147 ; 8.12.52, **51** (31), 125.—No. 146 in the Refiner's Notebook series gives Pt 6 on electrical installations, with particular reference to code sealing requirements. Figures illustrate the requirements.

No. 147 gives Pt 7 of the subject, and deals further with sealing requirements. Illustrations of a typical seal and of sealing requirements at an explosion proof panel board are given.

No. 148 deals with breathers and drains, and illustrates use of a seal and drain for enclosure. G. A. C.

Miscellaneous

492. Stainless steel in the petroleum industry. R. Hammond. *Petroleum, Lond.*, Dec. 1952, **15** (12), 321–5.—In this review the author indicates the tremendous range of stainless steels available to the petroleum technologist and stresses the need for a careful consideration of operating conditions before any particular alloy is selected for any specific purpose. R. E. P.

493. Production and uses of clad steel plate. H. Canzler. *Petroleum, Lond.*, Dec. 1952, **15** (12), 326–7.—This article (based on a paper read at the 4th International Mechanical Engineering Congress in Sweden) describes the production of clad steel plate by hot rolling, together with physical properties and plant design data. Cladding saves considerable quantities of non-ferrous metals and alloying constituents, such as chromium, nickel, and molybdenum, and is therefore of increasing economic importance. It is suggested that plant requiring a total wall thickness greater than $\frac{1}{16}$ inch can be economically constructed in clad steel. R. E. P.

494. Stainless steel and aluminium in the U.S.A. Anon. *Petroleum, Lond.*, Dec. 1952, **15** (12), 328–30.—Part of a report by a technical assistance mission which recently made a tour of a number of American manufacturers and plants in order to investigate the reasons for the leading position of the U.S. in the chemical and petroleum industries. The mission concludes that :—

(1) As regards materials of construction for chemical equipment, the level of technique seems to be much the same in the U.S. and in Europe.

(2) The use of stainless steel in the U.S. is expanding rapidly.

(3) Welding methods are generally similar to those used in Europe with one exception : to a considerable extent ordinary unstabilized stainless steel is welded with water cooling so as to reduce the heating time to the point of rendering carbide precipitation negligible. R. E. P.

495. Cutting and welding stainless steel. Anon. *Petroleum, Lond.*, Dec. 1952, **15** (12), 331–2.—Recent developments in cutting and welding methods for stainless steel are reviewed, which enable the heat- and corrosion-resistance and the other valuable properties of this versatile metal to be used on an increasing scale. Particular importance is attached to the finishing operations, grinding, polishing, and buffing. R. E. P.

BOOK REVIEW

Encyclopaedia of Surface Active Agents. J. P. Sisley and P. J. Wood. New York: Chemical Publishing Co. Inc., 1952. Pp. iv + 540. $15.00.

Professor Sisley has performed a monumental task in classifying and recording details of over 2500 brands of surface active agents manufactured throughout the world. Pt I of his book describes in general terms the properties and applications of surface active agents and includes a very detailed classification of these products into over 200 types. Each type is discussed with indications of the method of manufacture and chemical composition. Special chapters are devoted to the applications of cationic active compounds and to the uses of non-ionic compounds in the textile industry.

The Encyclopædia proper comprises Pt II of the book, each product being listed alphabetically by trade name, and details are given of the manufacturer, composition, position in the classification system, general properties, and applications.

It is obvious that the preparation of this book must have required an enormous amount of patience and detailed work, so that it is scarcely fair to criticize it on the score of not being up to date. Nevertheless, the internal evidence from literature references and the absence from the Encyclopædia of a number of well known products manufactured in the U.K. at least indicates that the book has been a very long time in preparation. Such a statement as that on p. 84 to the effect that certain brands of alkyl aryl sulphonates may become " serious competitors of soap in the future " lends point to this view.

It is also considered that the sections dealing with the manufacture of the products do not take into sufficient account the part played by the petroleum industry in providing raw materials, thus there is no reference to the manufacture of secondary alkyl sulphates from olefins (only from secondary alcohols), and the derivation of propylene tetramer from petroleum is inferred rather than stated. Further, the section on naphthasulphonates (incidentally classified under " products obtained from paraffin hydrocarbons ") contains a rather obscure reference to their surface active properties.

In criticizing this book from the point of view of out-of-dateness and the references to products from the petroleum industry, it would be doing less than justice to the author to disregard the immense service he has rendered to those interested in the manufacture and applications of surface active agents, particularly the textile industry. While the price is high, the cost would be repaid many times over by the saving in laboratory work in the analysis of products of which details may be given in the book. C. L. G.

ADDITIONS TO THE LIBRARY

Destillieren Betriebstechnik. Frankfurt-am-Main: Dechema Deutsche Gesellschaft fur chemisches Apparatewesen. Pp. 71. DM. 28.40.

This publication, the latest in the series " Dechema Discussions," consists of a series of sheets bound in a loose-leaf folder dealing with the separation of liquid mixtures by distillation. The first part includes a list of definitions and the theory of distillation of binary, ternary, and multi-compound mixtures.

The next section deals with plate and packed columns, together with accessory apparatus such as stills and condensers.

Further sections deal with the methods of operation, both batch and continuous, together with a discussion of pressure and vacuum distillation, and azeotropic and extractive distillation.

The publication represents a compilation dealing with the chemical engineering efficiency of the various processes described, and includes 140 literature references which are mainly American and German. The reference to Underwood, for example, does not include his fundamental series of papers which were published in the *Journal of the Institute of Petroleum*.

Symposium on Insulating Oils. Fourth Series. Pittsburg, Pa.; American Society for Testing Materials, 1952. Special Technical Publication No. 135. Pp. 37. $1.00.

This contains the two papers and the discussion on them at the November 1951 meeting of ASTM Committee D-9. The papers are Pts II and III of "Evaluation of Mineral Transformer Oil during Service" and deal with (Pt II) "Correlation of oil characteristics with continued transformer operation" and (Pt III) "An examination of selected transformers."

I.C.I. Engineering Codes & Regulations. Group D. Vol. 1. 3. Fire Prevention. London: Imperial Chemical Industries Ltd., 1952. Pp 72. 8*s.* 6*d. post free.* (Obtainable from the Royal Society for the Prevention of Accidents, 38 Millbank, London, S.W.1.)

Fire prevention is defined as "those precautions which are taken with the object of eliminating the possibility of an outbreak of fire," and this volume is devoted to the broad principles of fire prevention and fire protection. Its scope is limited to precautions for operation and maintenance where engineering aspects are affected by the design or construction. One chapter deals with the storage and handling of inflammable gases, liquids, and solids.

Photogrammetric Mapping from Air Photographs. Technical Staff of Hunting Aerosurveys Ltd. London: Iliffe & Sons Ltd., 1952. Pp. 54. 7*s.* 6*d.*

A simple and readable explanation of the principles of photogrammetry in its use for surveying and making measurements and drawings of the earth's surface from aerial photographs. This booklet is well illustrated by photographs of apparatus and line diagrams to enable the reader to follow the text.

British Standards. British Standards Institution:

B.S. 45: 1952. Sparking Plugs. Pp. 23. 4*s.* net, post free.

B.S. 122 Pt II: 1952. Milling Cutters and Reamers, Pt 2: Reamers, Countersinks and Counterbores. Pp. 48. 15*s.* net, post free.

B.S. 731 Pt I: 1952. Flexible Steel Conduit and Adaptors for the Protection of Electric Cable. Pp. 13. 2*s.* 6*d.* net, post free.

B.S. 756: 1952. Dean & Stark Apparatus. Pp. 25. 4*s.* net, post free. In this revision of the Dean and Stark apparatus for the determination of small quantities of water by distillation, several revisions have been made since the previous (1939) standard. These changes do not, however, invalidate other apparatus still in use.

B.S. 1889: 1952. Dimensions of Foundry Moulding Boxes. Pp. 11. 2*s.* 6*d.* net, post free.

B.S. 1894: 1952. Electrode Boilers, of Riveted, Seamless, Welded, and Cast Iron Construction, for Water Heating and Steam Generating. Pp. 100. 12*s.* 6*d.* net, post free.

B.S. 1900: 1952. Secondary Reference Thermometers (Centigrade Scale). Pp. 13. 3*s.* net, post free.

B.S. 1901 Pt 1: 1952. Stirrup Pumps, Pt 1: Piston Type. Pp. 7. 2*s.* net, post free.

B.S. 1906: 1952. Hose Couplings (Air and Water) ($\frac{1}{8}$ inch to $1\frac{1}{4}$ inch nominal sizes.) Pp. 57. 10*s.* net, post free.

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Oilfield Exploration and Exploitation

Geology

496. Oil finding. F. A. Morgan. *Petrol. Engr*, May 1952, **24** (5), B69–72.—A general survey of the oil industry, together with remarks on problems confronting the geologist in future petroleum explorations. A number of references are also made regarding the objects and work of the American Assoc. of Petroleum Geologists. Due mainly to the advance of geological science over the past thirty years, many new fields have been discovered and a great increase in production has taken place in California and elsewhere in the U.S.

It is considered that the greatest tool of the exploration geologist in the future will be access to a more liberal use of the drill. In this way we could continue to further advance and build up the science of subsurface geology, an approach which, in the past, has been responsible for the discovery of many oilfields. G. S. S.

497. Factors of sedimentary basin development that control oil occurrence. L. G. Weeks. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 2071.—The subject of this article is so broad in its scope that only a few selected phases can be dealt with. Two of the basic factors intimately related to oil occurrence are the basin architecture and conditions of environment within the basin. These headings cover such basic subjects as the crustal framework of the earth, the development and classification of basins, and the world-wide and basin-wide distribution of oil.

A calculation based on a review of oil occurrences in the world shows that approx half of the 185 billion brl of oil found to date in the world occurs in carbonate rocks. Inasmuch as carbonate rocks comprise only 15 to 18% of all sediments, it appears that the incidence of proved oil occurrence is several times higher in carbonate rocks than in the non-carbonate sediments.

Oil occurrence, in common with the sedimentary facies and like any natural phenomenon, is more directly controlled by the environment of deposition than by any other

factor or combination of factors. The environment that exists on the deposition bottom and in the sediments directly below is to a large degree dependent on the basin-bottom form or configuration and the supply of sediments. These, in turn, are mainly determined by the fundamental basin architecture or physical framework, which varies with the manner in which basins of different genetic types form and develop. E. N. T.

498. Facies relationships of organic reefs. P. E. Cloud, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 2125.—In this paper the writer deals with the numerous types of ancient and modern organic reef.

Since 1945, the drilling and study of surface features and ecology of the modern reefs, as well as the geophysical investigation of atolls, seamounts, and their environs, has led to new information on the hitherto poorly known elements of the reef problem, particularly from the point of view of the importance of reefs as foci of oil accumulation.

Whether or not the suggested generalizations are substantiated, the author's efforts of classification will have been in order if they help to bring the rapidly accruing data into better focus or elicit critical comparisons with known reef structures. E. N. T.

499. Critical analysis of cretaceous stratigraphy and paleobotany of Atlantic Coastal Plain. E. Dorf. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36** (11), 2161.—Knowledge of the stratigraphy and palæontology of both Cretaceous and Cenozoic deposits of the U.S. Atlantic Coastal Plain has been greatly increased in recent years, due to the valuable data derived from field studies as well as the study of the well samples.

Spangler and Peterson have suggested the assignment of the Raritan formation to the Early Cretaceous; however, it is here shown that both floral and faunal evidence indicates that none of the Potomac group formations can be correlated with any part of the Raritan formation of New Jersey.

The beds overlying the Potomac group in Maryland and Delaware are here considered correctly assigned to the Raritan formation. On the evidence of both plants and vertebrates, the Arundel and Patapsco formations of the Potomac group are more reasonably assigned to the Early rather than the Late Cretaceous as was previously believed. E. N. T.

500. Stratigraphy of coastal plain of New Jersey. M. E. Johnson. *Bull. Amer. Ass. Petrol. Geol.*, 1952, **36**, 2150.—In this article the author attempts to correct some of the statements made by Spangler and Peterson in their paper on the stratigraphy of the coastal plain of New Jersey presented in 1951 before the American Association for the Advancement of Science (Sect. E).

In addition to commenting on the conclusions reached in this paper, and summarizing the stratigraphical knowledge of the area, several new geologic sections, including some along the New Jersey Turnpike, are now presented. E. N. T.

Geophysics and Geochemical Prospecting

501. Geophysical activity. E. A. Eckhardt. *Petrol. Engr*, May 1952, **24** (5), B74–81.—The expansion of geophysical activity during 1951 was unprecedented. Seismograph work required the services of 791 crews, an increase over 1950 of 20·4%, and gravity operations needed 123 crews, an increase of 12·2%.

Preliminary figures for 1951 indicate that U.S. production of crude oil was an all-time record. The year also appears to have been a record for the industry, an achievement in which geophysics has played an important part.

Geophysical activity in the mining industry is also referred to, and figures are given of expenditure, distribution of work, methods employed, and other data.

Personnel is dealt with at some length. More well-trained and experienced men are needed for present operations, and still more will be required if apparent future demands are to be met. G. S. S.

502. Principle of direct interpretation methods in gravimetry and magnetism. B. Farre and R. Dalby. *Rev. Inst. franç. Pétrole*, 1952, **7** (7), 217–34.—The indirect classical methods for interpreting the potential field observed at the surface of the earth usually involve the assumption of a mass distribution for which the effects are calculated,

and this distribution is progressively modified until a close fit with the observations is obtained. In the indirect method discussed the observed field is continued downwards by analytical means so as to approach the actual structure, and this involves the calculation of the successive derivatives of the vertical component of the field. The mathematical basis of the method is indicated, and diagrams illustrate the comparative closeness with which the second derivatives reveal the geological features when the anomalies are well defined. G. D. H.

503. Research on geochemical well-logging. E. Vellinger. *Rev. Inst. franç. Pétrole*, 1952, **7**, 239–49.—By geochemical well-logging it is hoped to gain information on the existence of oil in the neighbourhood of the well; it searches for traces of hydrocarbons adsorbed on the rocks. It involves desorption from cuttings and cores, with analyses of the gas collected. As the reservoir rock is approached the amount of hydrocarbons rises rapidly. The reservoir rock is viewed as an emitter of hydrocarbons, because no formation is absolutely impermeable. Methane will effuse most readily. Estimates have been made of rate of loss of gas, but it is clear that conditions must be complex, and diffusion is also involved; moreover, the time of gas formation is not known.

Cutting samples are taken, carefully stored to avoid contamination, dried in a pure atmosphere, and carefully pulverized. 200 to 300 g is heated to 90° C under a very low vacuum, and the extracted gas is subjected to micro-analysis. Alternatively, 10 g is pulverized, placed in a cooled flask, and treated with phosphoric acid. When attack in the cold ceases the flask is warmed under partial vacuum, gases passing to the apparatus for micro-analysis. This technique may release hydrocarbons other than those adsorbed in the course of migration, and so may be less helpful.

In the analytical apparatus hydrocarbons higher than methane are condensed in liquid air, and methane is burnt on a platinum spiral. At Quissac the two desorption methods gave parallel results. Wet desorption may have generated certain gases.

A series of structures has been studied. These have widely different hydrocarbon values, but only at Lacq has a commercial accumulation been found. The results are discussed. The basic material for the Lacq studies was unsuitable, being mixed with mud, for the direct comparison of the results with those obtained elsewhere. No important anomaly was noted, but for one Lacq well the higher hydrocarbon content rose on approaching the reservoir. However, Lacq has little gas.

High hydrocarbon values have been noted in dark rocks, believed to carry other organic matter. This is supported by observations of the organic carbon and nitrogen contents at Bastennes-Gaujac. However, the hydrocarbon content varies more widely than the other materials. G. D. H.

504. Patents. U.S.P. 2,596,463 (8.5.46; 13.5.52). A. J. Barthelmes, assr to Seismograph Service Corpn. Method of determining the nature of subsurface geological structures in regions where there is at least one buried stratum of relatively high characteristic speed by seismic surveying employing refraction shooting. V. P. P.

U.S.P. 2,609,438 (24.1.47; 2.9.52). A. C. Winterhalter, assr to Sun Oil Co. Seismic prospecting apparatus comprising a high frequency transmitter, a receiver for signals transmitted by said transmitter, and means controlled by said receiver for differentiating and recording detected seismic signals.

U.S.P. 2,610,226 (12.5.50; 9.9.52). J. M. Klasse and H. Jensen. Method and apparatus for conducting geophysical surveys from an aircraft. D. A. R.

Drilling

505. Drilling mud problems in San Juan Basin. H. C. Leland and R. P. Nichols. *Petrol. Engr*, May 1952, **24** (15), B53–4.—Properly controlled drilling muds are an important factor in overcoming many problems associated with drilling operations. One of the conditions affecting mud practices is where salt and anhydrite occur in association. Among the materials added to the muds are bentonite, barium carbonate, and salt. Salt water muds are prepared by adding rock salt in sufficient quantities to saturate completely the base mud. Special salt water clays are added to produce the necessary viscosities required to clean the hole, and starches are used as a filter loss control agent. G. S. S.

506. Mud practices in the Denver–Julesburg Basin. R. L. Robinson. *Petrol. Engr*, June 1952, **24** (6), B54–6.—Drilling is largely confined to the Dakota sands. Mud programmes to the top of the formation vary slightly, depending on the location within the basin. In general, 3000 to 6000 ft of Pierre Shale is drilled satisfactorily with native mud. Combinations of caustic soda and quebracho, or caustic soda and humic type thinners, are used for thinning the mud and controlling the filtration properties.

Emulsion muds, for drilling below the Pierre section, are prepared by adding either crude or diesel oil in varying amounts; an oil content of about 15 to 20% by volume is the most common. Typical mud properties before and after conversion to an emulsion are tabulated.

Saturated salt of gypsum-base muds are prepared by adding salt or gypsum in sufficient amounts to completely saturate the base mud before drilling into the contaminating zone. Typical properties of these muds are shown. G. S. S.

507. Apparatus for hydrocarbon determination in drilling mud. K. Jahoda. *Nafta (Krakow)*, 1952, **8**, 39–40.—Uses thermal conductivity of the gases (CH_4, air, and CO_2) from a sample of mud to alter the resistance, which is measured, of one arm of a Wheatstone bridge. Heavier hydrocarbons are previously absorbed. M. S.

508. New chemical product removes mud cake. Z. V. Morgan. *World Oil*, Dec. 1952, **135** (7), 168.—A method of cleaning wells prior to cementing operations involves the use of a chemical which reacts with the mud, removing it from the well bore, and also causes flocculation. The latter is of particular interest, since it brings about the complete neutralization of the chemical, and thereby cuts down on corrosion in the well.

Objections to other mud acids are reviewed, and the above method is described illustratively. A. J. H.

509. Introduction to the study of the behaviour of drilling muds under high temperatures and pressures. G. Ricard. *Rev. Inst. franç. Pétrole*, 1952, **7**, 183–97.—Deep wells involving high temp and pressures raise technical and economic problems regarding muds. To date the highest pressure may have exceeded 1000 kg/cm². Filtration rates will increase with increase of pressure differential, but the cake permeability will be simultaneously decreased. The hydrolysis of organic colloids is more rapid at high pressures and high temp. The effects of temp on muds are sometimes reversible and in other cases irreversible. These phenomena are also influenced in some cases by the duration of agitation, ageing, circulation or rest, and the number of cycles of heating and cooling.

Normal routine mud control takes note of the irreversible changes, and makes measurements under surface conditions which differ from those in the well. It is assumed that this surface control is adequate in terms of subsurface requirements. Filtration at high pressures and temp certainly differs markedly from that under surface conditions.

It is planned to test muds under conditions corresponding to the states of repose or of circulation in the hole. Ordinary laboratory tests are "static," but "dynamic" tests can be made with the test material being continuously renewed. For "static" measurements reagents are added to a mud sample which is agitated for a fixed time, after which its properties are measured; alternatively, the preceding steps may be taken, but before making the measurements the mud is heated for a fixed time and then cooled for the measurements.

In a well the mud is continuously contaminated, but in the laboratory the additions may be discontinuous. "Dynamic" measurements approach well behaviour in some respects.

In wells materials may change with time, and this must be studied. Thus clays may be transformed and the pH change. The principal properties to be studied are filtration and the rheological characteristics. The filter-press can operate at 200° to 250° C and static pressures of about 1000 kg/cm², and the same is true for the concentric cylinder viscometer and rigidimeter (these are for "static" studies). The conditions applicable in the "dynamic" apparatus are less extreme. G. D. H.

510. Compressed air drilling cuts costs. Anon. *Petrol. Engr*, June 1952, **24** (6), B62–3.—Air drilling is being used successfully in the South Mountain field, Ventura Co.,

California. Since the new process started in 1951, the completion of surface drilling has been made by air in more than ten wells from three different island locations. Air drilling has resulted in 50% saving of surface drillings costs over the cable tool method through reduced drilling time.

A battery of nine compressors supplying 4180 cu. ft. air/min are used to create a constant volume of compressed air. This is forced into the drill pipe down to the bottom of the hole under approx 100 lb of pressure. On escaping, it expands, cooling the bit and bringing the cuttings to the surface, where they are expelled through the flow pipe under the floor of the rotary drilling table. G. S. S.

511. California soundproof drilling. W. T. Rintoul. *Petrol. Engr*, June 1952, **24** (6), B36–40.—Thousands of brl of oil are now being recovered from highly restricted residential areas by the rapid development of soundproof drilling. Much opposition had previously been encountered, but to-day, by constant engineering research, soundproof drilling has become a reality, and the entire development of a field can be effected without public disturbance.

Soundproofing material consists of two layers of vinyl-coated glass cloth with 1-inch sheet fibre glass filling, especially heat-processed and quilted. Other features of the operation include a shaft-driven rotary table, rubber kelly bushings, and the connexion of inside exhausts with two outside master mufflers through flexed tubing. Though soundproofing adds considerably to the cost of drilling and production, development of fields, such as the Sansinena, is still a profitable operation. G. S. S.

512. Special drilling and producing practices used to meet conditions in Uintah Basin. E. N. Dunlop. *Petrol. Engr*, June 1952, **24** (6), B71–4.—The Uintah Basin presents unusual drilling and producing conditions that have been satisfactorily overcome by the application of slight modifications of techniques.

Reference is made to high pressure zones, crooked holes, completion practice, stimulative treatments, fishing, logging, special muds, pumping methods, and costs. The quality and characteristics of the crude oil produced are summarized. G. S. S.

513. How wells are drilled in Permafrost. R. C. Jensen. *World Oil*, Dec. 1952, **135** (7), 152.—Drilling for oil on northern slope of Alaska has given rise to some unique problems, mainly due to the condition of " permafrost " encountered in that region. This is deeply frozen ground, and may be classified into : (*a*) continuous, (*b*) discontinuous, and (*c*) sporadic permafrost. In certain localities a surface active layer is found which may be frozen or thawed according to the season, and is underlain by the stable zone. The former is approx 2 ft deep, while the latter is known to extend from 600 ft on the northern shore to 1100 ft southward in the foothills. The temp gradient has been shown to be approx the same as for either areas. The support of derricks depends on the particular region and the season. With the use of steam, the piling may be set in ice, and if a danger of thawing exists, refrigerants may be used to maintain a sufficiently low temperature within the supports. Where piling is impractical, refrigerated timber mats have been used.

A certain amount of trouble was encountered in cementing operations. Use has been made of an insulated conductor casing ; the dead air space of 2 to 3 inches has prevented the freezing within the casing. The depth of 100 ft is reported as the coldest point in the permafrost.

All-the-year drilling has been possible by enclosing the derrick completely. Crews are accommodated in insulated transportable huts. Special clothing has been used. A. J. H.

514. Science and technique in Soviet Union (Monthly review). Use of drill engine for feeding drill pipe. Mezhlumov and B. Blocki. *Nafta* (*Krakow*), 1952, **8**, 74–6.—Translation of original paper. M. S.

515. How to increase drilling line service. J. N. Kemple. *World Oil*, Dec. 1952, **135** (7), 160.—Wear in drilling lines may be concentrated at two sections of the line. The max movement is obtained in the middle section which runs on the sheaves of both blocks, and a substantial contribution to the wear occurs at the drum where " scrubbing " takes place. Reduction in the tendencies to " scrub " and the use of correct sheave sizes consistent with dia of line are both recommendations. In addition,

it is recommended that a line longer than is necessary to reeve the system be used, and that the line be moved periodically according to the ton-miles covered. The routine for selecting economic lengths to move is outlined. Although requiring more care initially, such calculated programmes are more advised than routine methods having no regard for particular cases. A. J. H.

516. Combined rotary and percussion drilling. W. Paraszczak. *Nafta* (*Krakow*), 1952, **8**, 2–5.—Describes apparatus devised by Bassinger and one by Lewis. M. Ringler is continuing research in that direction. M. S.

517. Integrated drilling barge has maximum flexibility. C. F. Albright and P. L. McLaughlin. *World Oil*, Dec. 1952, **135** (7), 139.—Rated for drilling to 20,000 ft, the barge has recently completed its first well to 11,159 ft. It is 190 × 54 × 12 ft deep, and consists of two main decks and a third partial deck.

Two power features include: the fluid transmission, which cuts out much unnecessary shock loading, while allowing the engines to operate at optimum speed; and automatic drilling control, which besides releasing the driller, results in a greater rate of penetration than normally expected from manual control. The engines, giving 3350 h.p., are mounted in rubber blocks so as to minimize vibration. Mud tanks were constructed with rounded corners to cut down on settling in the tanks, and the location of rotary impellers well below the surface also prevents the uneven concentration of mud. Mud may be de-gassed immediately on leaving the mud ditch. This is an outstanding addition to such layouts. Both the travelling block and hook are the largest of their kinds. All fluid lines are colour-coded. A central lubricating system has been installed.

Auxiliary equipment is well developed, and air conditioning is provided for all quarters. The rig provides many reasons for reduced costs in drilling, mainly on the expected rate of penetration, less maintenance, and general ease of operation.
A. J. H.

518. Cementing of casing in drill holes. Z. Obuchowicz. *Nafta* (*Krakow*), 1952, **8**, 36–9, 63–6, 95–9.—The chemistry of the hardening of cement is fully described and followed by a description of oil well practice. M. S.

519. Experimental electronic logging of coal-seeking drillholes. J. Hubicki and Z. Wierzbicka. *Bull. of Polish Petrol. Inst.*, 1952, (**2**), 1–2. (Suppl. to *Nafta* (*Krakow*), 1952, **8**.)—To find any overlooked coal seams the Polish Petroleum Institute carried out the logging on three drill-holes. Coal shows less activity than sands. Details of the three experiments are given. Small dia of holes helped to get high γ activity. Geological profiles available from coring were correlated with G.M.—counter logging. Thin steel pipes supporting the walls did not interfere much with the latter. This method of logging proved itself useful for the coal mining industry. M. S.

520. Science and technique in the Soviet Union (Monthly review). Small diameter drills equipped with differential screw feed. R. Piatkiewicz. *Nafta* (*Krakow*), 1952, **8**, 19–23, 58–60. (From *Boorovoye Dyelo*, by B. I. Vozdvizhenski and S. A. Volkov.)—These drills are particularly useful in hard formations when a diamond bit is used. The working is described and explained with diagrams. Three drills of Soviet manufacture are described: GP 1, ZIF 75, and ZIF 150. Screw feed is designed by Vozdvizhenski, and a small geological drill based on a 1·5-ton lorry are subjects of Pt 2 of the paper.
M. S.

521. Patents. U.S.P. 2,595,525 (11.3.47; 6.5.52). E. J. Huckshold, assr to Central Mine Equipment Co. Mining drill having removable bits formed of rod stock, preferably of polygonal cross-section. The head of the drill is provided with a pocket having an interior contour conforming to the exterior contour of a co-operating wedge. The contours of socket and wedge are preferably conical, but in certain regions both wedge and socket are recessed to provide in each a space fitting part only of the exterior contour of the bit to be employed. The recesses are so formed and proportioned as to fit the bit in more than one orientation.

U.S.P. 2,595,307 (9.10.46; 6.5.52). J. P. Selburg, assr to Dresser Equipment Co. Mobile derrick rig having a mast structure which is elevated to the operating position

and depressed for transportation by one or more hydraulically operated telescopic rams.

U.S.P. 2,598,099 (15.3.48; 27.5.52). W. F. Bates, J. N. Gregory, and A. H. Curry, assrs to Shell Development Co. Equipment for transferring an elongated load of drilling equipment from a movable carrier to a derrick installation, in which pivot mountings are provided on the carrier to enable the equipment to be transferred to the derrick base without the use of hoisting equipment.

U.S.P. 2,595,401 (10.12.45; 6.5.52). J. Moon, assr to Signal Oil and Gas Co. Power operated drill head and swivel structure which may be mounted upon a power operated hoist and which moves with the drill pipe as the drill pipe advances during drilling and which also functions to rotate the drill pipe.

U.S.P. 2,598,203 (15.1.51; 27.5.52). W. L. Acker. A self-contained reversible drill rotating mechanism with a drill spindle advancing and retracting pressure feed that extends through the bore of the drill rotating mechanism, thus permitting a shorter overall length of apparatus for the same spindle travel.

U.S.P. 2,596,828 (13.6.49; 13.5.52). A. L. Stone, assr to Standard Oil Development Co. Apparatus for handling pipe which includes an extensible retractable arm including a hook embodying a hinge member which describes an arcuate movement under excessive loading.

U.S.P. 2,597,198 (23.10.47; 20.5.52). H. M. Staggs and L. F. Davis, assrs to Atlantic Refining Co. Control means *A* for controlling the level of liq in a tubing string of an oil well, the reservoir pressure of which is insufficient to raise the liq to the surface. *A* is automatically actuated by applying an auxiliary fluid *B* under pressure and by alternating differentials between the pressure of *B* and the hydrostatic pressure of the liq in the string to admit liq from the well reservoir into the tubing string until a predetermined level of liq in the string is reached and then to seal off the string against admission of further liq from the reservoir. *A* can be used in combination with the "intermitter" means for controlling the level of the well liq in the string to ensure its operation.

U.S.P. 2,595,241 (1.8.47; 6.5.52). R. W. Goble, assr to Eastman Oil Well Survey Co. Method of measuring the cross-sectional area of a well bore in which high frequency sound waves continuously transmitted from a point within the well bore are reflected from the wall of the bore back to their source, and the time between emission and reception is determined.

U.S.P. 2,596,361 (23.1.50; 13.5.52). D. W. Blancher, assr to Bendix Aviation Corpn. Method of telemetering up a well bore data on the operating characteristics of a pump in the well. A first carrier wave is generated in the well and frequency modulated in accordance with the stroke of the pump, and a second carrier wave is generated in the well and frequency modulated in accordance with stresses developed in the pump rod. The two waves are then transmitted to the surface over a pair of existing elements in the well consisting, *e.g.*, of the production tube and the sucker rod separated by insulating spacers.

U.S.P. 2,597,085 (17.4.44; 20.5.52). D. H. Larsen, assr to National Lead Co. Oil-base well-drilling fluid containing an oil-dispersible asphalt (gilsonite, manjak, glance pitch, grahamite) sufficient to reduce filtration loss. V. P. P.

U.S.P. 2,609,880 (4.3.48; 9.9.52). J. G. Dyer. Apparatus for sealing wells comprising a sealing-material container having a rip-cord seam and detachable suspension means for lowering the container, which means operate to open the container and discharge its contents when detached from the container.

U.S.P. 2,609,882 (31.8.50; 9.9.52). B. E. Morgan and G. K. Dumbauld, assrs to Standard Oil Development Co. In cases where a drilling mud contains an additive adversely affecting the setting of cement, a well is cemented by using an aqueous inorganic cement slurry containing from 0·5 to 10% by weight of activated charcoal based on the dry cement in the slurry.

U.S.P. 2,610,689 (19.8.46; 16.9.52). J. E. Eckel, assr to Oil Center Tool Co. Well lead seal.

U.S.P. 2,611,455 (10.9.49; 23.9.52). R. Woods. A portable oil well derrick that can be erected to form a self-braced structure.

U.S.P. 2,612,471 (19.2.51; 30.9.52). P. W. Fischer assr to Union Oil Co. of California. A drilling fluid composition prepared by dispersing in mineral oil 1 to 10% by weight of a specified saponified rosin, 0·1 to 10% by weight of a hydratable clay; an alkaline earth metal base in an amount related to the rosin; 0·2 to 10% by weight of water and 0·05 to 2% by weight of a hydroxy-polyoxyethylene ether of a long chain fatty acid partial ester of sorbitan. D. A. R.

Production

522. Seasonal variations in the flow of oil wells. R. Tomaschek. *J. Inst. Petrol.*, 1952, **38**, 591–605.—It is shown that certain flowing wells in the Eakring area, which have not otherwise been disturbed, display annual variations in the flow of total fluid and that a similar periodicity exists in the production of the whole Kelham oilfield. There appears to be a connexion between these variations and the seasonal movements of the earth's crustal layers. A. R. W. B.

523. A survey of injection of natural gas before and during water flooding. J. N. Breston. *Petrol. Engr*, June 1952, **24** (6), B64–70.—A general survey of the varied operations and methods employed in gas ejection. Gas has been ejected into over 1500 wells on at least seventy-five leases of approx 5100 acres in the Bradford–Alleghany fields.

Producers who have given the practice a reasonable trial are agreed that it is beneficial. In addition to advantages of greater oil and gas production, such benefits as increased water intake rates, more balanced (efficient) flood, and decreased wax problems are reported. Where water has already been injected, the additional gas is expected to produce more oil by increasing gas saturation, improving the mobility of the oil, and by solution of interstitial paraffin.

Graphs are given showing results of gas injection into a water flood project in the Bradford field, with tables of its economic gain. G. S. S.

524. California water flooding. N. van Wingen. *Petrol. Engr*, May 1952, **24** (5), B66–8.—California is about to join other states where water flooding is being practised on a commercial scale. How extensive the secondary work will be, will depend largely on the future relation between primary production and demand, and the price of crude oil. Nothing so far has been done actually either to prove or disprove the California possibilities. Though a few laboratory tests have shown increased recovery, they are totally inadequate to be even generally indicative.

Furthermore, in California, perhaps to a greater extent than in other states, the willingness of management to conduct the necessary engineering and laboratory work prior to the instigation of a field flood is of great importance if success is to be attained. G. S. S.

525. Economic advantages of unitization. Pts. I and II. B. A. Landis, Jr. and L. E. Brock. *Petrol. Engr*, May 1952, **24** (5), B83–8; June 1952, **24** (6), B76–86.—Unitization is the act of combining separately owned tracts and rights in certain lands and leases in a way that will allow orderly development and max ultimate production without regard to lease or property lines, but with due regard for the correlative rights of all parties.

Some of the general economic advantages are outlined: produced gas can be stored underground until a market is developed for its sale; a reduction of operating and development costs and material inventories; and duplication of gas, water, pipelines, and pumping stations can be almost totally eliminated by unitization.

Examples of four units are given showing the economic advantages of unitization for reservoirs of widely different characters and in various stages of completion.

The second part is a comprehensive study of primary and unitized secondary results, and includes a description of Units B, C and D (Unit A appeared previously).

Specific instances are mentioned where unitization has indicated economic advantages to those who intend to follow such a programme. Though there are many problems yet unsolved in the field of unit operation, groups are undertaking more concentrated studies of the whole subject. Many illustrations and a number of references accompany the paper. G. S. S.

526. Rotative gas lift a success in deep well. J. F. McDonald. *World Oil*, Dec. 1952, **135** (7), 195.—A report is given of this producing system for a 9000-ft well in Oklahoma. In general, the application to such wells is recommended where adequate make-up gas is available with a certain amount of produced gas. Efficiency is quoted as approximately 50%. A. J. H.

527. Acid action rate equalized in limestone and dolomite. P. L. Menaul. *World Oil*, Dec. 1952, **135** (7), 200.—Acidizing principles have been studied in the laboratory. It is suggested that the spearhead of the acid solution drive is the first to be "spent," and that there then occurs the precipitation of the insoluble sulphate, gypsum, and settling of silt particles. The acid described consists of a 15% solution of hydrochloric acid, with an admix which slows the reaction with limestone and speeds it with dolomite. It has the property of preventing the precipitation of the calcium sulphate, and the dispersion of silt is maintained sufficiently to permit the filtration through coarse filter paper.

Lab tests have been conducted to study the rate of reaction under conditions of varying pressure, temperature, and volume of acid solution/surface area of formation. The new acid is referred to as "equalized acid." A. J. H.

528. Pumping well service costs cut by corrosion control. B. W. Bradley. *World Oil*, Dec. 1952, **135** (7), 214.—A review of the control of corrosion by the use of certain inhibitors, with particular reference to practices in the Trapp Field, Arkansas. The relevant data and description of the treatment are given. Refs. A. J. H.

529. How you can compute gas reserves more accurately. D. Cornell. *World Oil*, Dec. 1952, **135** (7), 220.—The method requires only one pressure reading to be taken following a shut-in pressure of one to three days. The error involved in utilizing this reading is computed in terms of the quantity and rate of production, the characteristics of the reservoir, and the properties of the gas. Consistent with a higher degree of accuracy in prediction, it is necessary to record the pressure more accurately. Boundary conditions and assumptions are stated. The data are given graphically. Refs. A. J. H.

530. Packer modification solves dual completion problem. C. L. Kirkman. *World Oil*, Dec. 1952, **135** (7), 228.—In the case referred to, two zones existed, the upper of which was at sufficient pressure for flowing conditions, while the lower was at a lower pressure requiring some artificial means of production. Pumping in the latter was ineffective initially, due to vapour lock. It was subsequently arranged that the vapour be released by running a 1-inch string with the 2-inch tubing, and by-passing the packer with the 1-inch line. In this way, pumping was carried out up the 2-inch tubing, vapour vented up the 1-inch and normal flow from the upper zone permitted up the annulus. A second well also has been equipped as above. A. J. H.

531. Where producing research is headed. G. Herzog. *Petrol. Engr.*, June 1952, **24** (6), B16–18.—A survey of research projects pursued in the field and laboratory. The general trend of producing-research consists of studying all those problems that possibly could improve the recovery of known reservoirs or the detection of new hydrocarbon-bearing formations.

Subjects referred to are: the better understanding and evaluation of subsurface data; correlation between various logs by geological studies; the additional recovery through secondary methods; the study and development work on drilling muds, and research in connexion with mitigation of corrosion. G. S. S.

532. Rodless swabbing. B. Blocki. *Nafta (Krakow)*, 1952, **8**, 40–2.—Referring to a paper by Z. Wilk in *Nafta*, Nov. 1951, **7**. The author describes the method of rodless swabbing which he considers more economical. Action and construction of such pumping units are described in detail. M. S.

533. Cylindrical formation sampler. Z. Wilk. *Nafta (Krakow)*, 1952, **8**, 5–8.—Sampling is of extreme importance, especially just prior to bringing-in the well. True sample can only be obtained by use of gas-tight sampler which adheres tightly to the walls of the well. One such sampler is described with aid of diagrams. M. S.

534. Patents. U.S.P. 2,598,280 (10.7.50; 27.5.52). P. L. McLean, assr to M. L. Morgan. For use with an oil well tubing, a sucker rod having a hollow spiral blade thereon and a heating unit within the blade for use in removing solid paraffin.

U.S.P. 2,596,843 (31.12.49; 13.5.52). R. F. Farris, assr to Stanolind Oil and Gas Co. To increase the productivity of a formation *A* penetrated by a well, *A* is fractured by applying sufficient pressure to a vol of low-penetrating fluid *B* of visc >30 cp/20° C contained in a confined zone adjacent to *A*, at least part of *B* thereby entering *A*, *B* being withdrawn from the well after dilution with a solvent to reduce the viscosity. In U.S.P. 2,596,844 (J. B. Clark, assr to Stanolind Oil and Gas Co.) *B* contains a low visc hydrocarbon oil and sufficient hydroxy aluminium soap to produce a visc of ≯200 cp. *B* is pumped into the confined zone adjacent to *A* and additional liquid containing a gel-breaker is pumped in until fracture occurs.

U.S.P. 2,596,137 (19.2.49; 13.5.52). C. R. Fast, assr to Stanolind Oil and Gas Co. A gel of mineral acid and a water-sol gum which will break on long standing and has a filtrate rate <100 cc in 30 min (API Code No. 29, 1942-Tentative) is forced into a fracture in a formation penetrated by a well which is subsequently produced.

U.S.P. 2,596,437 (16.2.51; 13.5.52). G. H. Rohrback, R. A. Stoner, M. Macaulay, and W. T. Cardwell, assrs to California Research Corpn. Method of detecting relative movement of fluid in a well bore by measuring the potential between a pair of electrodes positioned in the bore, and correlating the direction of movement with the location of the electrode pair in the bore.

U.S.P. 2,596,146 (17.3.45; 13.5.52). M. W. Haines, assr to Vernon Tool Co. In pumping of deep wells by rod operated pumps, the rods often sink so slowly in the oil that the rate of pumping is restricted. This is overcome by keeping the pumping rod out of contact with the pumping column by means of a tube which immediately surrounds the rod, with the pumping column outside the tube. A fluid of low relative visc may be maintained in the tube to prevent entry of well fluid and/or to lubricate the rod. V. P. P.

U.S.P. 2,609,051 (27.4.50; 2.9.52). E. R. Brownscombe, assr to Atlantic Refining Co. A method of recovering, from oil wells by gas injection, oil which is substantially free from any separate gas phase.

U.S.P. 2,609,881 (27.11.48; 9.9.52). W. M. Warren, assr to Stanolind Oil and Gas Co. A method of cementing a tubular string in a well drilled while employing drilling mud, whereby a mud cake is formed on the walls of the well, said well penetrating a producing formation, comprising the steps of removing by abrading a substantial portion of said mud cake from said walls only at zones other than at said formation, placing a sealing fluid on said walls at both zones and said formation, and permitting said sealing fluid to set.

U.S.P. 2,612,117 (5.7.50; 30.9.52). H. J. Arnall. Auxiliary gas lift for oil wells.

U.S.P. 2,610,506 (7.1.49; 16.9.52). D. B. Taliaferro, C. F. McClung, and F. G. Mueller, assrs to U.S.A. (Secretary of the Interior). An instrument for locating the liquid level in wells subjected to a fluctuating pressure.

U.S.P. 2,612,346 (27.6.51; 30.9.52). N. A. Nelson, assr to Standard Oil Development Co. A device for obtaining samples in a well bore comprising a cage, fluid pressure actuated shoes to locate the cage in a well bore, and a fluid pressure actuated sample tube arranged to penetrate the wall of the bore. D. A. R.

Oilfield Development

535. Service operations in the San Juan Basin. H. J. Ayres. *Petrol. Engr*, May 1952, **24** (5), B48–50.—Distances, lack of good roads and communications, and extremes in weather are major problems hindering operations.

The casing programme on shallow and medium depth wells generally includes two strings of casing. Bulk cement is not yet available, and a small amount of sack cement is used. On the Mesa Verde wells (3500 to 5000 ft), it is sometimes necessary to resort to multi-stage cementing, using a stage cementing tool. Some producing companies employ rotating abrading devices on casing to insure a better cement job.

The San Juan Basin is already a proved area for large gas production, and offers great possibilities for future oil production. G. S. S.

536. San Juan Basin '51 find is good oil production. H. S. Birdseye. *Petrol. Engr*, May 1952, **24** (5), B44–6.—Until recently the only notable discoveries were the old Hogback, Rattlesnake, and Hospah fields. In July 1951 substantial production was obtained from the Tocito member of the Mancos shale, and the discovery well gave 20 brl/hr. The precise nature of the trap is unknown, but gravity and magnetic surveys show anomalies in the vicinity that could well result in forming a deep seated structure. A cross-section of the Tocito sandstone is given.

The same area has given proof of large gas reserves in the Pictured Cliffs sandstone and Mesa Verde section, apparently extending the vast Fulcher–Kutz and Blanco trends. G. S. S.

537. What stirs in the San Juan Basin? J. Menneer. *Petrol. Engr*, May 1952, **24** (5), B7–16.—The San Juan Basin is 100 miles in extent and has four fields operating: Kutz–Fulcher, West Kutz, Blanco–La Plata, and Barker Dome.

Activity first centred around the basin in 1930. Owing, however, to poor lines of communication and that productive formations were difficult under past production methods, development was slow. To-day, with new techniques and modern equipment, there is renewed activity, and the area is considered to be one of great promise. In 1950 eighty-five gas wells were drilled, and in 1951 over 200 wells gave production. The proved gas reserves are approx $4\frac{1}{2}$ trillion cu. ft. Oil production has not been on a large scale, but possibilities exist, and these are being explored. G. S. S.

538. Oil-gas areas beyond the East Texas field. J. Menneer. *Petrol. Engr*, June 1952, **24** (6), B7–10.—Two small areas within East Texas itself are described. The first includes the East Texas, Rodessa, Waskon, and Carthage fields, all of which are established producers. Production data are given. The second area covers Wood County, Texas; but although a promising field with an intensive drilling programme in preparation, it is too early to attempt to forecast its future oil potentialities. Production is being sought from the Sub-Clarksville and Woodbine Sands. G. S. S.

539. Exploration expands in Four Corners region. P. H. Umbach. *Petrol. Engr*, May 1952, **24** (5), B58–64.—The Four Corners area (from the corner common to the states of Colorado, Utah, Arizona, and New Mexico) has recently received much attention, and geophysical work and exploration drilling has become very active. Most of the drilling is confined to the Cretaceous sediments of the San Juan Basin, from which was obtained a great increase in production of gas and oil during 1951. During that year, the area produced over 40 billion cu. ft. of gas and nearly 400,000 brl of oil.

All the gas producing areas have continued to expand, with no definite limit yet established. There also appears to be a trend towards deeper drilling. G. S. S.

540. Some aspects of field operations in Kuwait. E. Boaden and E. C. Masterson. *J. Inst. Petrol.*, 1952, **38**, 395–409.—The Burgan oilfield covering approx 135 sq. miles is an elongated dome, the producing horizons are sandstones of Middle and Lower Cretaceous age with no producing well over 5000 ft in depth. Two methods successfully adopted to overcome circulation losses are described, and completion practices are also quoted.

Some details are given of production practices. A. R. W. B.

541. Caltex Pacific begins Minas field production. Anon. *Petrol. Engr*, June 1952, **24** (6), B89–90.—A very brief note on the operations of the Caltex Pacific Petroleum Mij. Oil was first discovered in Sumatra in 1939, but work was interrupted by the war. Since the Company resumed operations in Central Sumatra at the beginning of 1950, thirty-three wells have been completed in the Minas field. Further development of properties will depend on economic and other circumstances. G. S. S.

Transport and Storage

542. International survey of pipelines. P. Reed. *Oil Gas J.*, 22.12.52, **51** (33), 317.—Tables show principal foreign crude oil, products, and natural gas lines planned and under way. G. A. C.

543. Call answered for more Canadian pipelines. B. Shiels. *World Oil*, Dec. 1952, **135** (7), 232.—A review of Canadian pipelining operations. Nine were in operation before 1952, and in 1952 the principal lines were: Montreal–Hamilton products line; Sarnia–Toronto products line; Saskatoon pipeline; and Canadian Gulf line in Alberta. Projects continue to be planned. A. J. H.

544. Isotopes trace pigs in pipelines. K. C. Biederman. *Oil Gas J.*, 15.12.52, **51** (32), 124.—Experience in this use of isotopes for testing recently completed lines of United Gas Pipe Line Corpn U.S.A. in submarine and marshy locations is given.

Synthetic radium was used in two pigs run at 5-min intervals; and after initial operation isotopes were attached only to the rear pig. G. A. C.

545. Laying the Middle East's newest big-inch line. R. Finnie. *Oil Gas J.*, 29.12.52, **51** (34), 52.—The 26-, 30-, and 32-inch 555-mile 300,000 b.d. crude-oil pipeline from Kirkuk, Iraq, to Banias, Syria, on the Mediterranean coast is described, and details given of jointing operations, ditching, coating, wrapping, and pipe laying. G. A. C.

546. AIOC heats oil pipelines with electricity. Anon. *Oil Gas J.*, 22.12.52, **51** (33), 264.—Heat loss compensation in oil pipelines by uses of mineral-insulated copper-sheathed cables is described. Running costs exceed those for steam systems but save in maintenance. G. A. C.

547. How to gas-free storage tanks. Anon. *Petrol. Process.*, 1952, **7**, 1778–9.—Owing to the dense nature of hydrocarbon gases with respect to air found in petroleum storage tanks, the usual method of take-off from the top of the tank causes turbulence and diffusion. A new method, introduced by Shell Oil Co., uses a 16-inch-dia, 25-ft long cylindrical tube, comprising steel spirals clothed in a rubber fabric. It is very light, weighs only 45 lb, and is easy to handle. The heavy hydrocarbon gases are removed from the bottom of the storage tank without any turbulence taking place by inserting the tube vertically into the tank. In order to provide the necessary vacuum, a steam eductor is used. One capable of moving 300,000 cu. ft/hr of air and gas is to be used in the near future. J. W. H.

548. New method of rehabilitating cone-roof storage tanks. R. T. Effinger and D. G. Webb. *Oil Gas J.*, 15.12.52, **51** (32), 100.—The new method developed at Shell Oil Co.'s Martinez, California, refinery consists in removing an upper course, cutting tank away from its base, jacking it up, and installing a new bottom course.

Method results eventually in a tank with a shell as thick as, or thicker than, original. G. A. C.

549. Oil terminal at Canvey Island. Anon. *Engineer, Lond.*, 1952, **194**, 793.—Regent Oil Co. is constructing new ocean terminal with 60,000 tons capacity at Holehaven, Canvey Island (Thames). Twenty-five tanks, capacity from 500 to 4000 tons, being erected. Ring fire mains supplied by four pumps of total capacity 2000 g.p.m. draw from 1,000,000-gal water reservoir. 30,000-ton tankers will be handled by one of two new jetties, second jetty for smaller craft. Installation scheduled for service 1953. A. C.

550. New separator-scrubbers show good results. B. R. Keller. *World Oil*, Dec. 1952, **135** (7), 249.—The scrubbers are designed for use in compressor stations to handle 120 million s. cu. ft. gas/day at a working pressure of 450 p.s.i.; the dimensions are approx 4 ft. dia by 10 ft. long. The unit is in two sections, the first of which is for the removal of oil; it is provided with an automatic dumper for conditions where oil content is high. Dust accumulates in the second section on slowly rotating cylinders, on which is kept a film of oil. The scrubbers have been proved effective. A. J. H.

551. Mechanized work in construction of long distance gas pipelines. Anon. *Nafta (Krakow)*, 1952, **8**, 25.—Details of construction of the Dashava–Kiev and Saratov–Moscow pipelines. Electrical welding was used to join pipes and portable power stations supplied electricity. It took 90 sec to weld two 12-inch pipes, and γ-ray equipment was used to check the welds. Frozen earth was broken down with explosives when necessary. M. S.

552. Patents. U.S.P. 2,608,988 (29.1.47; 2.9.52). R. B. Ziegler, assr to Philadelphia Valve Co. Liquid distributor-controlling means for tank trucks.

U.S.P. 2,609,668 (23.10.48; 9.9.52). T. N. Dalton, assr to The M. W. Kellogg Co. Method and apparatus for pumping volatile liquids.

U.S.P. 2,609,669 (18.12.50; 9.9.52). W. R. Eddy, assr to Phillips Petroleum Co. In a liquefied gas system an automatic changeover valve mechanism includes a magnet for supplying an increment of force to a valve sealing member.

U.S.P. 2,609,964 (4.4.47; 9.9.52). R. K. Cadwell, assr to American Pipe and Steel Corpn. Valves and fittings for liquefied petroleum gas containers are mounted in a recessed portion of the container.

U.S.P. 2,610,900 (13.2.48; 16.9.52). W. M. Cross, assr to Kansas City Testing Laboratory. The method of simultaneously transporting a normally liquid petroleum product and granules of a water soluble solid material which comprises mixing the product and an aqueous brine containing said granules, controlling the rate of settling of the granules in the product, forcing the mixture through a pipeline, and separating the material and product.

U.S.P. 2,611,504 (3.6.47; 23.9.52). W. E. Busse and C. M. Orr, assrs to Chicago Bridge and Iron Co. A liquid storage tank having a floating roof with a lower portion normally immersed in the liquid, one or more shoes adapted to contact the side walls of the tank, and gravity operated means to increase the pressure on the shoe with decreasing distance between the roof and tank side wall.

U.S.P. 2,611,511 (12.11.49; 23.9.52). I. L. Wissmiller, assr to Chicago Bridge and Iron Co. In the storage of volatile hydrocarbon liquids in a vessel having a fixed capacity greater than the volume of the liquid, the steps of supplying a soluble non-condensible gas to the vapour space within said container when the pressure therein is less than atmospheric and selectively dissolving said gas in a selective liquid solvent when the pressure is greater than atmospheric.

U.S.P. 2,611,862 (15.6.50; 23.9.52). R. A. Riddle and T. J. Mesh, assrs to Gilbert and Barker Manufacturing Co. An electronic earthing apparatus for a tank truck, including an impedance bridge. D. A. R.

Refinery Operations

Refineries and Auxiliary Refinery Plant

553. International survey of oil refineries. R. B. Tuttle. *Oil Gas J.*, 22.12.52, **51** (33), 303.—A country by country survey gives refinery location and charging capacity (crude oil, thermal, and catalytic operations), together with a summary of world refineries. G. A. C.

554. Construction progress at the Escombreras refinery. I. Vendrell. *Combustibles (Zaragoza)*, 1952, **12**, 13–19.—Refinery based on Middle East crude, at present this crude is being dist into gasoline, kerosine, gas oil, and residue. In course of construction are a thermal reforming plant fed with S.R. naphtha, with phosphoric acid cat polymerization of unsaturated gases. The poly gasoline is due to be blended into the mixed S.R. and cracked gasolines after the latter have been doctor sweetened and ethylized. Preparations are also in hand for vac dist of topped crude into lub fractions which will be solvent refined and dewaxed. Total crude capacity will be 1,500,000 tons/year, supplying about 70% of national requirement. A. C.

555. Heat transfer at turbulent flow of liquids in pipes. M. A. Mikheev. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1952, 1448–54.—In case of liquids heat transfer equation can vary with direction of heat flow. Literature data were extensively examined for various fluids (air, alcohol, benzene, mineral oil, etc.) over a wide range of conditions and, as a result, a modified heat transfer equation has been deduced, $Nu_f = 0{\cdot}021 Re_f^{0{\cdot}80} Pr_f^{0{\cdot}43} (Pr_f/Pr_w)^{0{\cdot}25}$. In case of gases this can be simplified and, for air, it becomes $Nu_f = 0{\cdot}018 Re_f^{0{\cdot}80}$. Equations are applicable to straight pipes of any shaped cross-section. V. B.

556. Short cut to heat exchanger design. C. H. Gilmour. *Chem. Engng*, 1952, **59** (10), 144–8.—Nomographs are given which enable calculation of the dimensions of a heat exchanger to be made quickly for the case of cross-flow in the shell without phase change. D. H.

557. Service efficiency of simple tubular heat exchanger in brown-coal tar industry. H. G. Kayser. *General Discussion on Heat Transfer, Inst. Mech. Engrs, Sect. V*, 464–7, Sept. 1952.—The characteristics of the flowing materials are briefly described, and the design calculations and data are given of heat exchangers having six tube passes and six longitudinal, countercurrent, shell without expansion joint. The warm oil flows through the shell, and the cold oil through the tubes. Performance data are recorded and discussed. The exchangers have given excellent service over six years of continuous operation. Corrosion did not occur; a thin, tough, asphaltic layer had been precipitated which coated the surfaces of tubes and shell but did not exceed a certain film thickness. W. H. C.

558. An attempt to explain a discrepancy in observations of the heat transfer between a vertical surface and a fluidized bed of particles. M. Jakob. *J. appl. Phys.*, 1952, **23**, 1056.—Letter suggesting explanation of discrepancy between the theories of Dow and Jakob (*Chem. Engng Progr.*, 1951, **47**, 637) and van Heerden *et al* (*Chem. Eng. Sci.*, 1951, **1**, 51) for heat transfer between a vertical surface and a fluidized bed of particles. It is suggested that, since the former heated the fluidized bed and van Heerden cooled it, this may have caused turbulent conditions in the first case but not in the second, thereby giving different heat transfer characteristics. L. G. H.

559. Heat transfer. B. E. Lauer. *Oil Gas J.*, 15.12.52, **51** (32), 148; 29.12.52, **51** (34), 104; 12.1.53, **51** (36), 129.—Pt 16 of this series continues with coeffs of heat transfer through film between the inside surface of a warm tube and a cool liquid.

Pt 17 continues with coeffs of heat transfer through film between inside surfaces of a warm tube and cool liquid.

Pt 19 continues with coeffs of heat transfer through film between inside surface of a warm tube and a boiling liquid. G. A. C.

560. The centrifugal compressor—2. C. F. Koenig. *Oil Gas J.*, 12.1.53, **51** (36), 117.—No. 37 in the Engineering Reference Section discusses performance curves, and graphs show power requirements and typical performance of a single-stage compressor. G. A. C.

561. Centrifugal pump calculations—3. B. J. Lerner and A. J. Barduhn. *Oil Gas J.*, 15.12.52, **51** (31), 141; 29.12.52, **51** (34), 95.—No. 34 of the Engineering Reference Section discusses net positive suction head, and gives examples showing how to calculate a required suction head.

No. 35 describes how to calculate pump horsepower, and gives two examples. G. A. C.

562. Pumoridge pump index. Anon. *Fluid Handl.*, Oct. 1952 (33), 303.—Autometric G. P. Gear; Clarke Chapman Duplex cargo oil; Gascoine medium pressure-vacuum; Hydromo A, B, C, D, and E, Mono Radial; Pearn Direct acting RPV. Nov. (34): Autometric P; David Brown Roloid SH and H, Douglas; Drake and Fletcher DX and LO; Pearn direct acting VDP and HDP. Dec. (35): Bailey three throw; Clarke Chapman Duplex; Drake and Fletcher Quadrex S, P, H; Roloid, Rotopump type L. D. H.

563. Coryton refinery. Anon. *Fluid Handl.*, Dec. 1952 (35), 345–54.—The drainage and preparation of the partially water-logged ground to support heavy structures is described.

Details are given of the supply system of 45 million g.p.d. of cooling water, including the lime-zeolite softening and de-aerating plant for process water. D. H.

564. Gasoline plant design. Pt 8. Selection of Valves. O. L. Lewis. *Petrol. Engr*, Nov. 1952, **24** (12), C27–36.—The three main types of valve used in gasoline plant are block, throttle, and check, and the various forms of each type are described with reference to applications, materials, and design. Comparative costs are shown graphically for various sizes of four types of valves. The importance of correct specification for valves is emphasized. E. K. J.

565. How to save those critical alloys. Anon. *Petrol. Process.*, 1952, **7**, 1776–7.—An interim Advisory Committee on Alloy Steels set up by the API, have made eleven recommendations to the Petroleum Administration for U.S. Defence, applying to the allocation of steels for use in refineries. It is hoped that these recommendations, that apply to such alloys as nickel and molybdenum in ferritic alloy steels, primarily in pipe, tubing, and other fittings, will provide an aid in the conservation of these critical alloys. Austenitic and other nickel alloys are necessary in refining where straight chromium steels are impractical, because of high temps or corrosion by acids.

Other recommendations concerning alloys for petrochemical requirements and processing material are expected to be made in the near future. J. W. H.

566. How to simplify your flow sheets and process control diagrams. Anon. *Petrol Process.*, 1952, **7**, 1786–9.—The process flow sheet is a simple diagram, setting forth the basic idea of a process, omitting auxiliary lines and instrument symbols. The instrument or process control diagram is essentially the flow sheet with instrumentation added. A detailed process flow sheet with all process equipment, valves, etc., is termed an engineering flow sheet.

A method of simplifying the conventional method of representation of the above flow sheets is suggested by eliminating confused crossings and inserting curves to denote flow direction. Instrument lines are made non-parallel to the process lines.

J. W. H.

567. Better pump—cheaper bromination. F. Breese. *Petrol. Process.*, 1952, **7**, 1785.—Changes in the design of a glass pump aspirator for injecting liquid bromine into cooling tower water to kill bacteria and algæ, have saved many thousands of dollars by reducing the bromine consumption by about 50,000 lb/year. The two new features are : the mixing chamber, and a by-pass tube. Water from circulating pumps enters at 15 to 18 p.s.i. pressure, and flows through an inner tube into the cooling tower system, the bromine being sucked in through a tributary tube. J. W. H.

568. Accuracy in sizing control valves. R. A. Rockwell. *Petrol. Process.*, 1952, **7**, 1792.—Because the determination of a control valve size for a given application is not an exact science, it is necessary to evaluate flow data from actual flow conditions in order to determine the requisite valve size. The valve flow coeff C_v, defined as the number of U.S.G/min of water which will pass through a given flow restriction with a pressure drop of 1 p.s.i., simplifies the problem of control valve sizing. For liquids, C_v is the ratio of flow g.p.m. to the square root of the pressure drop in p.s.i., corrected for sp. gr. With the determination of C_v it is still necessary to select the optimum valve size, both from a performance and economic point of view. J. W. H.

Distillation

569. Prediction of height equivalent to a theoretical stage in packed liquid–liquid extraction columns. S. R. M. Ellis. *Industr. Chem. Mfr*, 1952, **28**, 483–6.—In liq–liq extraction systems, knowledge of mechanism of diffusion of solute between continuous and dispersed phases is very limited. Also difficult to gauge interfacial areas involved, hence rigid analysis not possible at present. Since H.E.T.S. values known

to vary from 1·0 to 20·0 ft, following empirical equation, developed for vertical columns packed with Raschig rings, is of value :—

$$\text{H.E.T.S.} = \frac{C \cdot \mu_c \cdot (d)^n \cdot (U_c)^{0.5}}{\Delta\rho \cdot (U_D)^{0.5}}$$

where H.E.T.S. = height of theoretical stage, inches ;
μ_c = visc of continuous phase, cp ;
d = dia of Raschig rings, inches ;
U_c = continuous phase velocity (cu. ft/hr) (cross-section of empty tower, sq. ft.) ;
U_D = dispersed phase velocity (units as U_c) ;
$\Delta\rho$ = sp. gr. difference between phases ;
n and C = read off curves showing variation of these factors with mutual solubility of phases.

This equation applies to extraction of solutes from aqueous solutions when solute moving from continuous to dispersed phase, and assumed packing dia $> \frac{3}{8}$ inch. Similar equation, neglecting ration of velocities but using a different factor C, is given for case where diffusion takes place from dispersed to continuous phase. A. C.

570. Patents. U.S.P. 2,610,141 (1.4.49 ; 9.9.52). W. D. Prout, assr to Standard Oil Development Co. An extractive distillation process, wherein the overhead condenses into a solvent phase and a non-solvent phase containing quantities of the bottoms component, is improved by extracting the non-solvent phase with the distillation solvent and returning the extract and the solvent phase to the distillation zone.

U.S.P. 2,612,468 (4.11.47 ; 30.9.52). C. E. Morrell and E. H. Gilliland, assrs to Standard Oil Development Co. Water miscible aliphatic alcohols, having 2 to 6 carbon atoms per molecule forming aqueous azeotropes of boiling points which differ by less than 5° C, are separated by distilling in the presence of a specified proportion of an aqueous salt solution. D. A. R.

Ger.P. 850,006, 24.7.52. J. Geller and H. Ratte, assrs to Rütgerswerke A.G. Process for continuous dehydration and connected continuous or discontinuous fractionation of crude pyridine.

BrennstChemie, 1952, **33** (15–16). R. T.

Absorption and Adsorption

571. Absorption dry distillation and underground storage. R. L. Lane and B. J. Thompson. *Petrol. Engr*, Nov. 1952, **24** (12), C37–9. (*Natural Gasoline Assoc. Mtg. Houston, Texas, Apr.* 1952.)—The operating problems encountered in absorbers operating at pressures of 500 to 1200 p.s.i.g. are oil loss, foaming, temp rise of absorption oil, overloading, and energy conservation. Methods of avoiding these difficulties are discussed. Dry distillation to strip the absorption oil using hydrocarbon vapours has the advantages of reduced corrosion and elimination of : (1) steam plant, (2) freeze-up of control equipment, (3) dehydration of product. Disadvantages are fixed recycle of non-condensed vapours and difficult condensation of product vapours. Underground storage of 750,000 gal of L.P.G. in a cavern at the Breckenridge, Texas, plant of Warren Petrol. Corpn is described. E. K. J.

572. Patent. U.S.P. 2,609,887 (30.4.49 ; 9.9.52). C. H. O. Berg, assr to Union Oil Co. of California. Adsorption process and apparatus. D. A. R.

Solvent Extraction and Dewaxing

573. Propane deasphalting of residua. J. G. Ditman and F. T. Mertens. *Petrol. Process.*, 1952, **7**, 1628–32.—The development of a bench scale batch deasphalting technique for the separation of asphalt from an asphaltic crude residue giving yields and products very similar to those obtained by continuous counter-current operation under certain operating conditions, is presented.

The propane deasphalting process carries separation, according to molecular weight,

further than ordinary commercial distillation, and permits almost complete recovery of oil from the residua.

The process is carried out in a bomb, the body of which is made from a 3-ft length of standard 6-inch pipe, fitted with a water jacket; with a hemispherical top head and a conical bottom, welded on. 800 to 1500 cc of residua are placed in the bomb, and liquid propane admitted until the correct charge proportions are made up. The bomb is then brought up to temp, and agitated for 20 min. Settling then takes place, and the oil–propane phase withdrawn. After two propane washes the asphalt is withdrawn from the bomb, via a ¾-inch valve at the base.

Constructional details of the bomb, together with specimen results, are given in tabular form. J. W. H.

574. Best conditions for introducing liquids into extraction columns. K. Szadkowski. *Nafta* (*Krakow*), 1952, **8**, 9–13 (from a paper by S. S. Eckel and K. N. Shabelina. *J. appl. Chem.*, **28** (2)).—Experimental details of inquiry into behaviour of liquid (A) fed into another, (B), show four stages, according to feeding velocity: (1) dropwise separation of (A) producing a large drop followed by two or three smaller ones; (2) dropwise separation of (A) in a series of even-sized drops at very short intervals; (3) formation of a stream of 5 to 10 cm length from which fairly even drops separate at its far end; (4) drops separate from sides as well as end of stream, and their sizes vary. Together with appearance of stream (stage 3), begins its vibration which extends, as feed velocity increases, from its far end to the orifice. The smaller the orifice the lower the feed velocity at which stage (3) occurs. Stage (4) is followed immediately by splitting up of the feed stream into smaller streams and formation of emulsion near orifice forming a cone with its vertex in the orifice. Both oil in water and water in oil systems were investigated. Data are collected in form of three graphs and related to size of orifice and velocity in a table. Optimum conditions for extraction depend, it is pointed out, on surface area of droplet, as well as on the total volume of those droplets if solubility is limited. Excessive feed velocity may cause entrainment. M. S.

575. Patents. U.S.P. 2,609,276 (24.9.48; 2.9.52). J. R. Casler and C. C. Nelson, assrs to Standard Oil Development Co. Process (and apparatus) for liquid–liquid solvent extraction for countercurrently contacting two liquids having partial immiscibility with respect to one another and of different densities which comprises maintaining a plurality of treating zones one above the other.

U.S.P. 2,609,277 (24.2.47; 2.9.52). T. L. McNamara, assr to Phillips Petroleum Co. A method of contacting two immiscible liquids of different specific gravities in a vertical column.

U.S.P. 2,610,108 (26.1.49; 9.9.52). J. W. Packie, assr to Standard Oil Development Co. A liquid–liquid extraction tower having stepped plates, each plate having a perforated portion, the perforations of the plates being in vertical alignment, and flow control means at the top of the tower for the light phase withdrawal and for the heavy phase feed.

U.S.P. 2,612,465 (29.6.48; 30.9.52). W. Kiersted and H. H. Gross, assrs to Texaco Development Corpn. Separation of oil and wax by continuous filtration. D. A. R.

Cracking

576. Better yields from cat cracking. C. W. Shelley and C. W. Rackley. *Petrol. Process.*, 1952, **7**, 1772–5.—The type of molecular structure and boiling range of the charge stock is of primary importance in catalytic cracking, as these characteristics will determine the ease of cracking and the nature of the cracked products. In some cases it is necessary to improve and prepare the catalytic charge stocks by the use of such refining processes as propane deasphalting or solvent extraction with liquid SO_2 or furfural, etc.

It has been shown that catalytic cracking yields from highly aromatic stocks, such as catalytic heavy gas oil from Mid-continent crude, can be improved by solvent refining with furfural. This extraction was conducted at 100° F in a continuous three-stage pilot unit, with solvent percentages varying from 25 to 200, based on the charge

stock. The yield of catalytic gasoline from the raffinates was very high, whereas the total gas oil and butane yield diminished as the treating severity was increased.

Further study was made to determine if paraffins gave the most desirable product distribution by dewaxing the raffinate from a 100% furfural treated catalytic gas oil with a benzol-acetone mixture. A wax yield of 11% raffinate was removed.

J. W. H.

577. Heat transfer in a bed of fluidized solids. C. van Heerden, P. Nobel, and D. W. van Krevelen. *General Discussion on Heat Transfer, Inst. Mech. Engrs, Sect. IV*, 358–60, Sept. 1952.—The results are reported of an extensive investigation of heat transfer measurements in a fluidized bed of carborundum, coke, iron oxide (Fe_3O_4), Devarda's alloy, and lead, with air, various mixture of nitrogen and hydrogen, argon, carbon dioxide, town gas, and raw methane as fluidizing gases. A series of homogeneous sieve fractions, as well as some mixtures of different sizes of coke and carborundum, were investigated, the particle dia varying from 50 to 800 μ.

W. H. C.

578. The heat transfer and flow resistance for fluid flow through randomly packed spheres. W. H. Denton. *General Discussion on Heat Transfer, Inst. Mech. Engrs, Sect. IV*, 370–2, Sept. 1952.—The results are given of investigations to determine, over a range of high Reynolds numbers, the fundamental relations between the average and local surface-heat-transfer coeffs, the flow resistance, and mass flow rate, for the flow of fluid through a cylindrical bed of randomly packed spheres when the heat is generated in the spheres. Interpretation of the heat transfer and flow resistance characteristics is made, and the analogy between heat and mass transfer and their dependence on the physical properties of the fluid is described and discussed.

W. H. C.

579. Heat transfer by fluidized beds. H. A. Vreedenberg. *General Discussion of Heat Transfer, Inst. Mech. Engrs, Sect. IV*, 373–5, Sept. 1952.—Heat transfer coeffs from a fluidized bed of solids to the surrounding wall of a tube inserted in the bed, or vice versa, are known to be high. All available data, however, has been obtained in laboratory apparatus of only a few inches dia. After it was found that for several types of solid particle, for instance, sand characteristic data, such as bed porosity and the slugging tendency, are functions of the tube dia, measurements were made of the heat transfer from a bed of 0·565 m to a water-cooled tube in horizontal as well as in vertical position and at various positions in the bed. The results are reported and discussed.

W. H. C.

580. Cat cracker catalysts, how they work best. Pt I. C. O. Brown and R. B. Wainwright. *Chem. Engng*, 1952, **59** (11), 148–9.—The effects of particle size on fluidization, operation and stripping efficiency, metal erosion, and catalyst losses are discussed.

D. H.

581. Patents. U.S.P. 2,609,332 (25.8.48; 2.9.52). V. O. Bowles and A. H. Schutte, assrs to The Lummus Co. Process for the continuous conversion of heavy residual oils into coke and lighter hydrocarbons.

U.S.P. 2,611,736 (16.11.48; 23.9.52). V. Haensel, assr to Universal Oil Products Co. A reforming catalyst, for reforming a gasoline fraction, is prepared by halogenating alumina, forming into particles, calcining the particles at 1000° to 1400° F, comminuting the calcined particles with a platinum compound–ammonium hydroxide solution to form a final catalyst containing from 0·01 to 1% by weight of platinum and heating the composite at 500° to 1000° F.

D. A. R.

Ger.P. 850,449, 24.7.52. G. Free and L. Raichle, assrs to Bad. Anilin- & Soda-Fabr. Process for carrying out cat reactions in the gas phase.

Ger.P. 850,450, 24.7.52. G. Free, assr to Bad. Anilin- & Soda-Fabr. Method for producing iron-free activated alumina for cat purposes.

Ger.P. 851,053, 31.7.52. G. von Shuckmann, assr to Farbenfabr. Bayer. Method for producing cat containing chromic oxide and cupric oxide.

BrennstChemie, 1952, **33** (15–16).

R. T.

Polymerization

582. Patents. U.S.P. 2,609,359 (21.3.46; 2.9.52). W. J. Sparks and D. W. Young, assrs to Standard Oil Development Co. A tripolymer of molecular weight of at least 18,000, comprising at least 80% by weight of a C_{3-4} alkene, 0·01 to 5% of a polymerizable unalkylated aromatic hydrocarbon or a C_{1-10} alkyl derivative thereof, and 0·1 to 15% of a C_{4-15} polyene or vinyl acetylene.

U.S.P. 2,609,362 (4.10.48; 2.9.52). C. F. Fryling and C. A. Uraneck, assrs to Phillips Petroleum Co. Synthetic rubber is produced by copolymerizing in aqueous emulsion 1 : 3-butadiene and styrene in presence of phenyl (dimethyl) hydroperoxymethane and maintaining specified ratios of compounds present and a pH value of 9 to 11·8.

U.S.P. 2,609,363 (29.10.48; 2.9.52). L. M. Welch, assr to Standard Oil Development Co. A copolymer of a major proportion of *iso*butylene and a minor proportion of a divinyl aromatic compound having a minimum of cold flow and possessing surface pressure sensitivity, is prepared by using specified proportions of reactant feed.

U.S.P. 2,609,366 (4.10.48; 2.9.52). C. F. Fryling and J. E. Troyan, assrs to Phillips Petroleum Co. Synthetic rubber is produced by polymerizing 1 : 3-butadiene at 0° to −40° C in an aqueous medium containing methanol sufficient to give the medium a freezing point below the poylmerization temperature under conditions which cause the emulsion to be of oil-in-water type and the resulting latex to remain fluid. Phenyl (dimethyl) hydroperoxymethane and an activator solution of ferrous sulphate and an alkali metal phosphate are added separately to the emulsion.

U.S.P. 2,609,387 (1.12.48; 2.9.52). C. H. Basdekis and E. F. Jackson, assrs to Monsanto Chemical Co. An amine inhibitor is removed from methyl acrylate by using a cation exchange resin which is insoluble in the methyl acrylate.

U.S.P. 2,610,170 (17.2.49; 9.9.52). L. A. Lundburg, assr to American Cyanamid Co. Gelling and curing of a partially condensed resin, capable of being cured to a water-insoluble ion-active product, takes place in a medium containing a petroleum sulphonate.

U.S.P. 2,610,173 (31.8.48; 9.9.52). G. E. Ham, assr to Monsanto Chemical Co. A method of preparing copolymers of 80 to 98% of acrylonitrile and from 2 to 20% of vinylidene chloride, in which monomers are added at a varying rate such that the reflux temp remains constant.

U.S.P. 2,610,174 (1.10.48; 9.9.52). F. G. Pearson, assr to American Viscose Corpn. A copolymer of trifluorochlorethylene and methyl methacrylate containing about 70·6 mol % of methyl methacrylate in the copolymer molecule, and the balance trifluorochlorethylene, said copolymer having a softening point of 260° C.

U.S.P. 2,610,201 (9.4.49; 9.9.52). J. T. Rutherford, assr to California Research Corpn. Dinonyl phthalate mixtures in which the nonyl radicals include a chain structure found in copolymer mixtures of *n*-butene-1 and *n*-butene-2.

U.S.P. 2,610,962 (3.12.46; 16.9.52). W. H. Smyers and D. W. Young, assrs to Dow Chemical Co. Styrene copolymers are produced by dissolving 5 to 30 parts by weight of high molecular weight styrene-*iso*-butylene copolymer having 60 to 70% combined styrene and an intrinsic viscosity of 0·6 to 0·95 in 70 to 95 parts by weight of styrene, adding benzoyl peroxide and polymerizing at 20° to 125° C.

U.S.P. 2,610,963 (14.4.49; 16.9.52). K. W. Doak and K. E. Wilzbach, assrs to United States Rubber Co. A fibre forming copolymer of a 1 : 3-butadiene and a diester of methylene malonic acid with an alcohol in specified molar ratios.

U.S.P. 2,611,760 (18.5.49; 23.9.52). E. M. Geiser, assr to Universal Oil Products Co. A process for the production of a resinous material which comprises condensing formaldehyde with the copolymer of a vinyl aromatic compound and an aliphatic mono-olefin containing from about 4 to about 8 carbon atoms per molecule in the presence of a non-oxidizing acid condensation catalyst having a dissociation constant greater than 1×10^{-3}.

U.S.P. 2,611,764 (9.9.49; 23.9.52). E. M. Geiser and A. J. de Rosset, assrs to Universal Oil Products Co. A resin comprising the copolymer of a conjugated diolefin

or a vinyl aromatic hydrocarbon with a fraction of liquids boiling above 140° C and resulting from the reaction of an aliphatic mono-olefinic hydrocarbon of not more than five carbon atoms, with oxygen at 180° to 300° C and a pressure above 35 atm.

U.S.P. 2,612,491 (25.8.51; 30.9.52). T. W. Evans, D. E. Adelson, and L. N. Whitehill assrs to Shell Development Co. A polymer of ethylidene acetate allyl maleate.

U.S.P. 2,612,493 (3.10.51; 30.9.52). W. J. Sparks and R. M. Thomas, assrs to Standard Oil Development Co. A process of homopolymerizing a non-conjugated diolefin of 7 to 26 carbon atoms having terminal isopropenyl groups, at a temperature of about −20° to −164° C in the presence of a Friedel–Crafts catalyst. D. A. R.

Alkylation

583. Patent. U.S.P. 2,612,531 (6.12.50; 30.9.52). J. T. Horeczy, assr to Standard Oil Development Co. An alkylate suitable for detergent manufacture is made by sulphuric acid polymerization of a C_4 olefinic mixture of I, II, III, and IV type olefines and hexanes at 175° to 225° F to give a C_{12} polymer which is used to alkylate a C_{6-8} aromatic hydrocarbon. D. A. R.

Isomerization

584. Patents. U.S.P. 2,597,372 (30.12.47; 20.5.52). H. Pines and V. N. Ipatieff, assrs to Universal Oil Products Co. Production of alkyl*cyclo*pentane and benzenoid hydrocarbons by reacting a *cyclo*hexane and a *bicyclo*hexane having a 5- and a 6-carbon ring at 200° to 450° C in the presence of a dehydrogenation catalyst at 1 to 40 atm pressure.

U.S.P. 2,598,642 (24.9.49; 27.5.52). F. R. Hurley, assr to Monsanto Chemical Co. Aromatizing *n*-heptane by contacting with a catalyst comprising managanese fluoride and iron fluoride in which Fe = 10 to 90 wt % of Fe + Mn, at 450° to 600° C in presence of minor proportions of O_2 and HF. V. P. P.

Ger.P. 851,187, 31.7.52. W. Reppe, K. Klager, and O. Schlichtling, assrs to Bad. Anilin- & Soda-Fabr. Method for producing *iso*cyclic compounds.
BrennstChemie, 1952, **33** (15–16). R. T.

Chemical and Physical Refining

585. Patents. U.S.P. 2,596,175 (28.10.48; 13.5.52). L. Rosenstein, assr to Texaco Development Corpn. Treating hydrocarbons with a peptized colloidal dispersion of alkali metal hydroxide in hydrocarbon oil containing an oil-sol metallic salt of an organic acid as the peptizing agent, *e.g.*, to remove mercaptans.

U.S.P. 2,596,692 (29.10.46; 13.5.52). J. T. Jordan, assr to Shell Development Co. Gaseous hydrocarbons containing non-hydrocarbon impurities, including H_2S, are purified by passing the gas under pressure into oil in a main absorption zone *A*, the unabsorbed gas being separated and a portion only thereof being passed into a lean oil, which oil is then used as the absorption oil in *A*.

U.S.P. 2,598,034 (19.1.49; 27.5.52). K. M. Brown and C. G. Gerhold, assrs to Universal Oil Products Co. Hydrocarbon gases containing mercaptans *A* are contacted with a solvent for *A* containing disulphides derived by oxidizing *A*.

U.S.P. 2,596,942 (14.7.49; 13.5.52). D. W. Robertson and C. F. Duchacek, assrs to Socony-Vacuum Oil Co. Colour of pet stocks such as oils and waxes is reduced by filtration with hydrated bauxite obtained by heating bauxite at *ca* 750° F for 2 hr and adding ± 2 wt % water. V. P. P.

Ger.P. 849,467, 17.7.52. H. Engel, assr to Bad. Anilin- & Soda-Fabr. Process for obtaining oil-free paraffin.

Ger.P. 850,044, 2.47.52. R. Lüben, assr to Ruhrchem. A.G. Process for obtaining commercial quality paraffins from high-boiling paraffin distillates.

Ger.P. 851,106, 31.7.52. F. Giller, F. Winkler, and F. Markert, assrs to Bad. Anilin- & Soda-Fabr. Process for separation of sulphur compounds from gases.

Ger.P. 851,239, 31.7.52. R. Brandt. Process and plant for separating carbon monoxide from gases and gas-mixtures containing org sulphur compounds by means of steam catalysis.

Ger.P. 851,107, 31.7.52. E. Krebs, assr to Gottfr. Bischoff G.m.b.H. Process for separating resins containing nitrogen from combustible gases.

BrennstChemie, 1952, **33** (15–16). R. T.

Special Processes

586. Studies in the Fischer–Tropsch synthesis: XIII. Structural changes of a reduced iron catalyst on reoxidation and on formation of interstitial phases. W. K. Hall, W. H. Tarn, and R. B. Anderson. *J. phys. Chem.*, 1952, **56**, 688.—Complete reduction at 450° or 550° causes a fused iron synthetic ammonia catalyst to develop a pore structure corresponding to about 45% porosity. On oxidation, the individual particle volume remains constant while the surface areas and pore volumes decrease. The oxidation rate is initially rapid, but becomes very slow after a few hours. The reoxidized catalyst is reduced much more readily than raw catalyst. Formation of interstitial nitrides and carbides causes expansion of catalyst particles and an increase in pore volume and average pore dia, the % porosity, however, remains approx constant.

L. G. H.

587. Patents. U.S.P. 2,595,544 (18.6.46; 6.5.52). E. A. Rodman, assr to E. I. du Pont de Nemours & Co. Inc. Dehydrating an organic liq by passing it upwardly through a column *A* containing an aq soln of a dehydrating salt, the concn of which increases from bottom to top, and thence upwardly through a column *B* of the solid salt, the salt soln thereby formed flowing back into the top of *A*, dilute salt soln being withdrawn from the bottom of *A* and anhyd organic liq from the top of *B*.

U.S.P. 2,597,204 (19.3.51; 20.5.52). R. W. Todd and R. E. Fuchs, assrs to Aquaness Corpn. Water-in-oil type pet emulsions are broken by adding C_{8-18} fatty acid esters of an oxyalkylated polyhydroxy compound of mol wt 2500 to 7500 derived by reacting an alkyl polyhydroxy compound with a mixture of ethylene oxide and 15 to 60 wt % propylene oxide.

U.S.P. 2,597,991–2 (3.7.48; 27.5.52). G. T. Heller. (*a*) Process, (*b*) apparatus for carbon black production in which a hydrocarbon *A* is heated to 1400° to 2400° F by flowing gaseous *A* upwards in a plurality of confined streams of dia $\frac{3}{32}$ to 1 inch, uniformly spaced apart by a distance between centres of 3·4 to 8·25 times said dia, through the lower part of a highly heated furnace, flowing air upwards around but out of contact with the gas streams at $\geq$3 ft/sec and without turbulence in amount to effect partial combustion of *A* and effecting partial pyrolysis and combustion of the resultant hydrocarbon by flowing the preheated gas streams upwards in contact with the air at an initial velocity of $\leq$12 times the velocity of the rising air current while preserving the integrity of the gas streams, and then completely diffusing the gas streams in the furnace atm to form carbon black.

U.S.P. 2,597,232–3 (23.3.48; 20.5.52). W. C. Ekholm and G. T. Heller. (*a*) Process, (*b*) apparatus for producing furnace black in which a turbulent stream of hot blast flame gases *A* of uniform composition and linear velocity is passed through a relatively narrow reaction chamber of rectangular cross-section $\geq$1·5 ft wide and of substantially greater length, and hydrocarbons are injected into the stream as a plurality of streams of 0·25 to 0·75 inch dia along the entire height of each side of the chamber, each stream being directed across the width of the chamber near and equidistant from the upstream end thereof, the ratio of mass velocity of make gas streams to mass velocity of *A* being in the range 3 : 1 to 10 : 1.

U.S.P. 2,596,950 (6.9.47; 13.5.52). H. I. Wolff, assr to Shell Development Co. Cyclic process for purifying $(NH_4)_2SO_4$ derived from spent refinery H_2SO_4 in which organic impurities are extracted by washing the salt with a volatile, water-soluble solvent for the impurities, the washed salt is dried with hot gas to remove solvent, and the effluent vapours are washed with an aq solvent, the resulting solution being combined with the salt extract solution and dist, and dist solvent recycled.

U.S.P. 2,595,254 (19.6.41; 6.5.52). C. E. Himminger, assr to Standard Oil Development Co. Continuous method for treating gaseous material *A* with powdered solid *B*, in which fresh *B* is gravity fed in an elongated confined stream to the bottom inlet *C* of a vertical cylindrical reactor *D*, the mixture of *A* + *B* being passed in separated short streams into *D*, where *B* forms a dense turbulent suspension in *A*. Gaseous material from *D* is freed from some *B* in a superimposed separation zone of larger dia than *D* and returned to *D*, remaining *B* being removed in a second separation zone and passed to the gravity feed. The method is applicable to the oxidn of naphthalene using vanadium oxide catalyst.

U.S.P. 2,596,344 (21.8.48; 13.5.52). H. A. Newey, E. C. Shokal, and T. F. Bradley, assrs to Shell Development Co. Fractionation of mixtures of polar organic compounds bearing unbranched hydrocarbon chains and of different degrees of olefinic unsaturation, by contacting with urea at 0° to 75° C. Mol complexes of urea with the more saturated compounds are formed and separated.

U.S.P. 2,596,086 (Switz. 30.10.44; 6.5.52). H. K. Müller, assr to Rodney Hunt Machine Co. Evaporator comprising an imperforate rotor mounted in a chamber with a vertical cylindrical wall, the central portion of which is heated. The rotor is provided with vanes extending at their lower ends below the heated area and radially into close proximity with the chamber wall. Dilute liquor is fed to the top of the chamber, and concentrated liquor withdrawn from the bottom.

U.S.P. 2,596,920 (30.7.48; 13.5.52). W. M. Smith, W. D. Luening, and S. C. Lane, assrs to Standard Oil Development Co. Fischer–Tropsch process in which reaction products containing dissolved cobalt compounds are passed to a cat decomp zone maintained at a lower pressure than the reaction zone (100 to 300 atm) but which is sufficient to prevent vaporization of the liq reaction products at cat decomp temp and in range 200° to 400° F.

U.S.P. 2,598,186 (20.12.48; 27.5.52). B. J. Mayland, assr to Phillips Petroleum Co. A mixture *A* of spent Fischer–Tropsch (Fe, Co, Ni) catalyst *B* and spent oxygen donor *D* (oxides of Fe, Co, Ni) from production of synthesis gas is passed at 1400° to 2000° F to steam decarbonization and regeneration, being contacted with steam + hydrogen at 1100° to 1250° F to remove carbon and waxes from *B* and partially oxidize *A*, further oxidn to *C* being effected with steam, and at least part of *C* being completely oxidized to *D* with hot gases containing excess oxygen and thereby heated to 2300° to 2800° F. Any remaining *C* is reduced for use as *B*.

U.S.P. 2,598,647 (1.2.47; 27.5.52). H. G. McGrath, assr to M. W. Kellogg Co. Fischer–Tropsch process in which a high yield of oxygenated compounds is obtained by using a fluidized iron catalyst containing 0·8 to 2·0 wt % of alkali metal oxide at 580° to 750°/50 to 500 psig.

U.S.P. 2,598,503 (29.3.47; 27.5.52). W. P. Burton, assr to M. W. Kellogg Co. In a Fischer–Tropsch process utilizing an iron catalyst containing 0·1 to 3·0 wt % of a cpd *A* of an alkali or alkaline earth metal which tends to be lost, the content of *A* is controlled by injecting into the regenerated catalyst prior to return to the reaction zone a mixture of *A* with a non-reactive liquid carrier completely volatile under the reaction conditions in amount to supply 0·005 to 0·1 lb of *A* (calc as oxide)/hr/ton of catalyst.

U.S.P. 2,596,160 (30.1.48; 13.5.52). H. G. McGrath, assr to M. W. Kellogg Co. Oxygenated organic compounds *A* present in hydrocarbon—rich *B* and water-rich *C* phases produced in Fischer–Tropsch process are separated by extracting *B* with a hydrocarbon-insol alcohol and *C* with a water-insol solvent, and the extracts are then combined and cat hydrogenated at 230° to 270° C/2900 to 3700 psia to convert *A* to alcohols.

U.S.P. 2,596,434 (20.8.47; 13.5.52). R. Pyzel, assr to M. W. Kellogg Co. In the reaction of hydrogen and a carbon oxide in presence of a pseudo-liquid fluidized catalyst at 300° to 650°/15 to 500 psig, a liquid fraction *A*, which is completely vaporized under the reaction conditions, is injected into the catalyst to maintain the desired temp, the reaction effluent is condensed, the liq product stripped of compounds boiling below *A* and <5 vol % of the residue is fractionated, a relatively low boiling fraction being combined with the stripped liq to form further *A*. V. P. P.

Ger.P. 850,743, 31.7.52. A Klemenc, assr to A. Klemenc and Reuttener Textilwerke A.G. Method for producing a gas mixture rich in H_2 and CO.

Ger.P. 850,001, 24.7.52. Bad. Anilin- & Soda-Fabr. Method for producing petrol. (Addn to Ger.P. 844,142.)

Ger.P. 850,298, 24.7.52. W. Oettinger and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Method for producing gaseous unsaturated and aromatic hydrocarbons. (Addn to Ger.P. 840,237.)

Ger.P. 849,738, 17.7.52. W. Jahnentz, W. Reichl, and K. Weichert, assrs to Chem. Werke Hüls G.m.b.H. Process for purification of arc-cracked gas.
BrennstChemie, 1952, **33** (15–16). R. T.

Metering and Control

588. Trends in refinery instrumentation. Pt 5. S. D. Ross and J. Procopi. *Petrol. Engr*, Nov. 1952, **24** (12), C41–4.—The fabrication and calibration of thermocouples are described with details of procedure. Methods of checking installed thermocouples are also given. E. K. J.

589. A simplified surface area apparatus and catalyst tester. D. E. Smith. *Petrol. Engr*, Nov. 1952, **24** (12), C52–6.—The apparatus, consisting of manometer, sample bulb, dewar flask, and sources of vacuum, nitrogen, and helium, is easily operated, inexpensive, and accurate for control purposes. Two methods of operation are described which give values varying by less than 5% when the sample tested is similar to that used for calibration. E. K. J.

590. Patents. Ger.P. 850,240, 24.7.52. W. Sauter. Device for measuring gas quantities, especially spirometer.

Ger.P. 849,908, 17.7.52. F. Rings, assr to G. Kromschröder A.G. Dry gas meter.

Ger.P. 849,909, 17.7.52. K. Schnelle, assr to Kohlenwertstoff A.G. Device for indicating the position of a liquid in a container.

Ger.P. 849,917, 17.7.52. R. Sonnenschein, assr to Siemens & Halske A.G. Device for magnetic oxygen metering.
BrennstChemie, 1952, **33** (15–16). R. T.

Products

Chemistry and Physics

591. Alkylnaphthalenes. Pt VII. The physical properties of *n*-alkylnaphthalenes. D. G. Anderson, J. C. Smith, M. Broomfield, and M. Mikiewicz. *J. Inst. Petrol.*, 1952, **38**, 415–27.—The methods of preparation of both *n*-heptyl, *n*-nonyl-, and *n*-undecyl-naphthalenes are given together with their physical properties. In addition, the infra-red spectra on these alkyl naphthalenes have been recorded, and their infra-red bands are listed. Similarly, data are given on the ultra-violet absorption spectra of these same hydrocarbons. A. R. W. B.

592. Critical range for micelle formation by an oil-dispersible soap in a hydrocarbon solvent. S. Kaufman and C. R. Singleterry. *J. Colloid Sci.*, 1952, **7**, 453–64.—The formation of micelles by calcium xenyl stearate in benzene containing 15% of the water required for saturation was measured by using the dyes Rhodamine B and Acridine Orange as fluorescent indicators. The critical micelle concentration was found to be $0{\cdot}6 \times 10^{-6}$ mole/l, and the size of the micelle was shown to be almost constant at concentrations from 1×10^{-6} to $7{\cdot}3 \times 10^{-3}$ M. Application of the Law of Mass Action leads to the conclusion that the concentration of dissolved single soap ions is always very small, and increases less than twofold between 10^{-5} and 10^{-4} M. This approx constancy explains the negligible increase in rust-inhibiting action or detergent action when the concentration of the relevant additive is increased many-fold. H. C. E.

593. Thermal decomposition of *n*-paraffins. (1) C. G. Silcocks and M. W. Travers; (2) C. N. Hinshelwood and C. J. Danby. *Nature, Lond.*, 1952, **170**, 1028.—Polemical. (1) The primary thermal decomposition products of *n*-paraffins are olefins and H_2. The rate of this decomposition cannot be followed by measuring changes in pressure.

(2) The reactions proceed partially by chain mechanism, and in many cases the pressure change is quantitatively proportional to the decrease in the amount of original paraffin. During decomposition of *n*-butane at 530° C, when the pressure has increased by 10% and by 25% the reaction mixture contains H_2 2%, butane 4%, methane 32%, and ethane 14% approx. H. C. E.

594. Spreading of liquids on low energy surfaces. V: Perfluorodecanoic acid monolayers. F. Schulman and W. A. Zisman. *J. Colloid Sci.*, 1952, **7**, 465–81.—The equilibrium contact angle (θ) has been measured for the following liquids, ninety in all, on monolayers of *n*-perfluorodecanoic acid (I) adsorbed on Pt, Cu, brass, and glass: *n*-alkanes, di-alkyl ethers, alkyl benzenes, glycols, fluorocarbons and other halides, esters, and siloxanes. The surface tensions (γ) of the liquids are also reported. It is found that the plot of $\cos\theta$ *versus* γ gives a series of straight lines for the homologous series: *n*-alkanes, dialkyl ethers, methyl silicones, perfluoro amines, and *pseudo*-perfluoro alcohols. Except for the latter, all show a decrease in $\cos\theta$ as γ increases. None of the ninety liquids would spread on the surface of the monolayers of (I), and comparison with earlier results (Abs. Nos. 2411, 2412—1952) shows that layers of (I) are the most non-wettable surfaces found. For most liquids in contact with hydrocarbon or fluorocarbon surfaces θ decreases in the order $CF_3 > CF_2 > CH_3 > CH_2$.

In view of the remarkable resistance to wetting shown by surfaces of (I) surface active compounds with CF_3 groups and a hydrophilic group in a single molecule should have unusual and valuable properties.

Values of the work of adhesion, spreading coeffs, and free energy decrease on immersion have been calculated from θ and γ. H. C. E.

595. The hydrogen–oxygen reaction sensitized by nitrosyl chloride. J. Chanmugan and R. G. Ashmore. *Nature, Lond.*, 1952, **170**, 1067.—Experiments are described which show that in the explosion of H_2–O_2 mixtures sensitized by NO_2 and NOCl, NO is concerned in the generating centres required for the initiation of chain reaction. Using a multiple-entry reaction vessel at 360° C and a stoichiometric H_2–O_2 mixture, (*a*) with NOCl (up to 0·5 mm pressure) added to the mixture outside the vessel; (*b*) with NOCl placed in the vessel first, it was found that with (*a*) the induction period increased with increasing NOCl pressure; with (*b*) the induction period (after admitting the H_2–O_2 mixture) decreased rapidly as the NOCl became decomposed. When NO was first placed in the vessel there was no induction period, and when under these conditions NOCl was added to the mixture an induction period was obtained.

These experiments indicate that an oxidation of NO is concerned with the explosion of H_2–O_2 under these conditions, and the chief function of NOCl is a chain terminator. They suggest that part of the induction period is the time required for the NOCl to decompose. H. C. E.

596. Determination of the velocity of burning. J. van Steenis. *Nature, Lond.*, 1952, **170**, 1068.—Phase contrast photographs of a flame are the most reliable and suitable for determining the velocity of burning, and a method by which such photographs can be obtained is described. Illustrations are given of a phase contrast photograph of a coal-gas flame with air, and one in which the flow of gas through the combustion wave is made visible with titanium chloride smoke. H. C. E.

597. Physical properties in homologous series. V. G. Aranda. *Combustibles* (*Zaragoza*), 1951, **11**, 4–20.—Discussion given of various properties which vary regularly (not necessarily linearly) in homologous series, *e.g.*, heats of formation and combustion, sp.ht., visc, surface tension, parachor, etc. Careful study made, covering about thirty homologous series, of values of mol vol and mol refraction, which do vary linearly with increasing mol. wt. Increment in value of these mol properties between successive terms of different series not quite constant but varies within narrow limits.

In formula $P_M = P_F + (P_{CH_2} + h)Z^1$

where P_M = mol property, *e.g.*, mol. vol.;
P_F = value of such property corresponding to functional groups forming extremities of mol or characterizing homologous series;
P_{CH_2} = value contributed by one CH_2 group to property in whole mol;
Z^1 = number of CH_2 groups in mol;
h = correction term;

numerical value assigned to P_{CH_2} for mol. vol is 16·34, and for mol. refraction 20·57. Value of h for mol vol varies from −0·07 for *n*-paraffins to +0·60 for α-bromo nitriles, while for mol refraction it varies from −0·23 for ortho-esters to +0·13 for alkyl-*cyclo*hexanes. Confirmation of numerical value 16·34 for mol vol of CH_2 group at 20° C is obtained by consideration of X-ray studies of hydrocarbon mols. Laws of variation in physical properties of members of homologous series have practical applications in quantitative and qualitative analyses of hydrocarbon mixtures, criteria of purity, problems of mol structure, etc. Mol refraction particularly applicable to such studies. A. C.

598. Synthesis of pure hydrocarbons. I. Aliphatic. N. R. Capdevila. *Combustibles* (*Zaragoza*), 1952, **12**, 92–107.—An account of work carried out under Project 45 of the API, and by the Hydrocarbon Research Group of the IP, on pure aliphatic hydrocarbons. Details of synthetic methods employed (reaction of aldehydes, ketones, or esters with Grignard reagents, dehydration of carbinol formed to olefin, and hydrogenation of olefin to paraffin), with final purification methods (fractional dist, adsorption). Tables showing eighty such reactions with most final products boiling in gasoline range, including yields at various stages and cat employed. 167 references. A. C.

599. Project 44—in the cards. V. B. Guthrie, ed. *Petrol. Process.*, 1952, **7**, 1769–71.—Physical and thermodynamic properties of hydrocarbons and related compounds developed by A.P.I.'s Research Project 44, have been set up for use on automatic punched card machines. A total of 36,500 punched cards carry over 100,000 entries on more than a thousand different compounds. This new method of selecting, arranging, and listing various compounds by any of their properties takes one fiftieth of the time taken by hand operations. Many errors can be eliminated once the task is properly set up, but human errors will increase where the tabulation or calculation is involved, and several people are working on it. J. W. H.

600. Poisoning of platinum catalysts having a low content of active metal on the carrier under conditions of dehydrogenating catalysis. Kh. M. Minachev, N. I. Shuikin, and I. D. Rozhdestvenskaya. *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk*, 1952, 603–15.—Pt (0·4 to 3·2%) on activated C was tested for activity in dehydrogenation of *cyclo*hexane in presence of *n*-propyl and *iso*-amyl mercaptans, thiophene, thiophane, diethyl and di-*iso*-amyl sulphides, H_2S and CS_2. Test temp 280° C, duration 45 to 100 min, 10 ml of *cyclo*hexane + ½ mg organically combined S. Action of all compounds same as that of equivalent amount of H_2S. Amount of organically combined S required to poison cat is proportional to amount of Pt in cat; to reduce cat activity by 70 to 80%, 6 to 7% S (on Pt deposited on carrier) is required. Tests were also made with Pt (1%) on Si gel and on micro-porous glass. Both these cat were more easily poisoned than with activated C as carrier, Si gel cat being the more resistant of the two. Activation energy of dehydrogenation reaction is unaffected by cat poisoning; it is concluded that poisoning acts by blocking of active centres on cat. V. B.

601. Role of oxygen-containing compounds in the synthesis of hydrocarbons from carbon monoxide and hydrogen. Yu. B. Kagan, Yu. B. Kryukov, E. V. Kamzolkina, and A. N. Bashkirov. *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk*, 1952, 649–57.—Experiments were carried out using 1 : 1 CO/H_2 over Fe cat at 20 atm and 300° C. Additions of small amounts of *n*-butyl and *n*-propyl alc were made during course of reaction and products analysed. From balance of O_2-containing products obtained it is concluded that neither alc is an intermediate product in hydrocarbon synthesis under the test conditions. Fe cat, under these conditions, accelerates oxidn of alcohols and aldehydes. Possible reaction mechanisms, whereby O_2-containing products are formed during hydrocarbon synthesis, are suggested. V. B.

Analysis and Testing

602. Vapour pressure of liquefied gases. Petroleum Gases Panel of IP. *J. Inst. Petrol.*, 1952, **38**, 394.—The possible dangers of bursting the Reid bomb when it is used to determine the vapour pressure of propane at 45° C are pointed out. A. R. W. B.

603. Investigations on the determination of kinematic viscosity using IP standard methods. Anon. *J. Inst. Petrol.*, 1952, **38**, 428–44.—As a result of an experimental investigation it was concluded that the kinetic energy and surface tension effects with the specially designed master viscometers used were negligible, and therefore the calibration constants of these viscometers could be based solely on the viscosity of water at 68° F. Specifications for the U-tube and suspended level master viscometers, which were of 400 mm capillary length, are given in an appendix. A statistical analysis of the experimental results obtained is also reported in an appendix. A suggested procedure for calibrating and stepping up viscometers is given, and it is recommended that IP 71/47(T) should be rewritten in the light of this work and raised in status from "Tentative Standard" to "Standard." A. R. W. B.

604. Graphic tracing of reactions of hydrocarbons mixture. H. I. Waterman and H. Booy. *J. Inst. Petrol.*, 1952, **38**, 526–31.—The changes taking place in a mineral oil in the course of processing are reflected in the magnitude and ratio of the number of aromatic and naphthenic rings per average mol of the sample. These ring contents are calculated from refractive index, density, and mol wt measured during the process.

Changes caused by opening or closing of rings can conveniently be followed by the aid of a graph in which aromatic ring content is plotted against naphthenic ring content. A. R. W. B.

605. Determination of water by the Karl Fischer method. C. Whalley. *J. Oil Col. Chem. Ass.*, Jan. 1953, **36** (391), 20.—The determination of water in oils, varnishes, and resins by the Karl Fischer method has been found to give results which agree closely with those obtained by the Dean and Stark procedure. The apparatus, reagents, and experimental procedure are described. It is thought that the method will be most useful where large numbers of routine determinations are to be made or where the quantity of material available is small.

The application of the method to paints is limited by the reactivity of some pigments with the reagent. This can be overcome, but the only advantage it shows over the Dean and Stark procedure is that it can be carried out on a small sample.

The Fischer method can be applied satisfactorily to water determinations in urea-formaldehyde resins, paints containing alcohol, and nitrocellulose lacquers.

A table is given comparing results obtained by the Fischer and Dean and Stark methods for a wide range of substances. D. K.

606. Direct titration of gasoline mercaptans. G. E. Mapstone. *Petrol. Process.*, 1952, **7**, 1655.—This method, which is more useful than back titration, involves the titration of the mercaptans in the sample gasoline (only 100 ml) with standard silver nitrate soln in the presence of an amine, to prevent the precipitation of silver oxide, and an alkaline extractant soln. A solutizer is added to increase the solubility of the mercaptans in the aqueous phase. Sodium nitro-prusside is used as an internal indicator.

Titration procedure and the calculation of mercaptan sulphur content of the sample, as wt %, are fully presented. J. W. H.

607. Bitumen and aniline. H. Mallison. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (10), 264.—When 20 cm^3 of freshly dist aniline is added to 0·2 g bitumen in an Erlenmeyer flask a brown solution results and a black coating is formed at ordinary temp, which disappears on heating nearly to the aniline b.p. On cooling without shaking the solution remains clear but deposits a black flocculent ppt on shaking vigorously. In conc solutions the phenomenon is more evident. Toluidine and xylidine react similarly, but the solubility of the asphaltic substances increases with increasing mol. wt. of solvent. To produce the phenomenon clearly a 5% bitumen solution in toluidine and an 8% solution in Xylidine must be taken. Pyridine, quinoline, nitrobenzene, and

anthracene oil solutions do not exhibit this phenomenon. Colloidal solutions of asphaltic bitumen substances are stable at ambient temp, but coagulate on shaking. Pptn varies according to soft. pt. and origin of the bitumen. R. T.

Crude Oil

608. The heat factor in treating heavier California crude oil emulsions. L. T. Monson. *Petrol. Engr*, June 1952, **24** (6), B11–14.—California fields commonly produce oils of lower API gravity and higher viscosity, and water of lower sp. gr. than do other areas. These characteristics have introduced many problems in the resolution of California crude oil emulsions.

Application of heat increases the gravity differential between oil and water, and decreases the oil viscosity; the latter has been shown to be the much more important effect. Several examples show frequent savings made by using less heat and more chemical in treating heavy California crudes, in the saving of light ends, and the achievement of cleaner oil. G. S. S.

Gas

609. Imaginative scheme for European natural gas supply. Anon. *Petrol. Times*, 23.1.53, **57** (1447), 56.—A preliminary report is reviewed compiled by Bechtel International Corpn. entitled "Natural Gas Supply for Europe," describing a vast project whereby Middle East natural gas could be delivered throughout Europe at a cost per 1000 cu. ft. (or million B.T.U.) ranging from 25 to 32 cents. G. A. C.

610. Italian natural gas industry. V. S. Swaminathan. *Petrol. Engr*, June 1952, **24** (6), B49–52.—The industrial exploitation of natural gas in Italy is a relatively recent development. AGIP, by introducing geophysical, gravimetric, and magnetometric methods, were responsible for the discovery of natural gas at Fontevivo and S. Giorgia–Podenzano. In 1939 seismic reflection was first employed, and this resulted in the location of the following fields: Caviaga, Ripalta, Cortemaggiore, Piacenza, and Cornegliano. 90% of the country's total output comes from Caviaga, Ripalta, and Cortemaggiore.

In Jan. 1952 the natural gasoline recovery plant at Cortemaggiore, which is claimed to be one of the largest in Europe, started processing 106,000,000 cu. ft. methane daily. The average depth of producing-wells is 5415 ft, and the formation Upper Miocene sand. The composition of its gas, gasoline, and oil distillations is tabulated. G. S. S.

Engine Fuels

611. Pre-flame reactions in diesel engines. Pt I. F. H. Garner, F. Morton, A. H. Nissan, and E. P. Wright. *J. Inst. Petrol.*, 1952, **38**, 301–12.—A comparison of the action of diesel oil additives upon the cetane rating of high and low Cetane No. fuels, when the additives were put into the liquid and vapour phase. It was concluded that their effect was related to the chemical character of the fuel and that in general an additive was more effective when added in the vapour phase to the intake air of an engine than when added in the liquid phase to the fuel. A. R. W. B.

612. Pre-flame reactions in diesel engines. Pt II. F. H. Garner, W. E. Malpas, F. Morton, W. D. Reid, and E. P. Wright. *J. Inst. Petrol.*, 1952, **38**, 312–29.—The design of a sampling valve having an opening time of 2° of crank angle at an engine speed of 1200 r.p.m. is described. Experimental results obtained with this valve sampling the combustion chamber of a Crossley engine are described, and methods used to determine the peroxide, aldehyde, and ketone contents of liquid products are given.

For all four fuels examined, peroxides and aldehydes were detected during the pre-flame period, and these results are discussed, as are further results obtained on motoring a CFR engine at low compression ratios and collecting exhaust samples.

A. R. W. B.

613. Vapour and air release from aviation fuels. L. O. Derry, E. B. Evans, B. A. Faulkner, and E. C. G. Jelfs. *J. Inst. Petrol.*, 1952, **38**, 475–515.—The solubility of air in kerosine and other petroleum products obeys Henry's Law closely, but does not vary greatly with temp. Gasolines which dissolve approx 25% of their volume possess the greatest solubility for air.

Data are presented to enable the loss of fuel to be expected under adiabatic conditions at any altitude and any initial fuel temp to be calculated given the RVP and ASTM evaporation curve of the fuel.

The general consequences of air release and vapour losses from aviation fuels, and methods of overcoming them, are discussed. A. R. W. B.

614. Aircraft turbine fuel supply problems. M. L. Granville. *Petrol. Engr*, Nov. 1952, **24** (12), C4–6. (*N.P.A. Mtg. Atlantic City, N.J., Sept.* 1952.)—The development of jet fuel specifications for military purposes in the U.S.A. are outlined and shown to be related to the resulting availability of fuels. Military consumption of jet fuels totals 100,000 b.d., which is supplied by seventy refiners. E. K. J.

615. Jet fuel specifications. C. W. Kelley. *Petrol. Engr*, Nov. 1952, **24** (12), C7–9. (*N.P.A. Mtg. Atlantic City, N.J., Sept.* 1952.)—The specifications for jet fuels since 1950 in the U.S.A. are tabulated, and the reasons for the changes are discussed. The general requirements, in order of importance, are : (1) availability ; (2) flammability ; (3) low temperature properties ; (4) volatility ; (5) stability ; and (6) odour, and the balancing of these factors in the latest specification is described. The need for reference fuels is emphasized to enable engine design to be developed to obtain the highest performance. E. K. J.

616. Jet fuel and the refiner. W. F. Krause. *Petrol. Engr*, Nov. 1952, **24** (12), C9–10. (*N.P.A. Mtg. Atlantic City, N.J., Sept.* 1952.)—The advantages associated with the production of jet fuels, especially for the small refiner, are : (*a*) widening of markets, and (*b*) provision of an outlet for low octane gasoline and naphtha, so reducing the T.E.L. requirement for motor gasoline. E. K. J.

617. Suitability of jet fuels. E. A. Droegemueller. *Petrol. Engr*, Nov. 1952, **24** (12), C13–17. (*N.P.A. Mtg. Atlantic City, N.J., Sept.* 1952.)—The properties of jet fuels are considered with reference to engine design. The effect of aromatic boiling range on the coking tendencies of various jet fuels is shown graphically. Chemical composition, not volatility, of the fuel is the critical factor in carbon deposition, which is the major problem of suitability of fuels. The combustion efficiency is shown to increase with volatility for a given temperature. E. K. J.

618. Jet fuel for civil aircraft. J. B. Hill. *Petrol. Engr*, Nov. 1952, **24** (12), C17–20. (*N.P.A. Mtg. Atlantic City, N.J., Sept.* 1952.)—The prospective requirements and specifications for civil aircraft uses of jet fuels are reviewed. E. K. J.

619. More on military jet fuels. Anon. *Oil Gas J.*, 12.1.53, **51** (36), 119.—No. 153 in the Refiners Notebook series enlarges on specifications given in the previous number with reference to jet fuel grades, straight-run, and cracked blends. G. A. C.

620. Patents. U.S.P. 2,609,279 (26.11.49 ; 2.9.52). K. G. Morris, assr to Standard Oil Development Co. A turbo-jet fuel consisting essentially of a liquid hydrocarbon composition containing at least 50% by volume of aromatics and 0·1 to 5% by volume of cumene hydroperoxide.

U.S.P. 2,612,439 (8.7.48 ; 30.9.52). J. G. McNab, assr to Standard Oil Development Co. A diesel fuel consisting of a hydrocarbon diesel fuel base stock having more than 0·5% sulphur and containing about 0·01 to 1% of a mixture of calcium petroleum sulphonate and an alkaline earth metal salt of an alkylated phenol sulphide, the alkaline earth being calcium, barium, or magnesium and the alkyl group having from 8 to 18 carbon atoms. D. A. R.

Ger.P. 848,984, 10.7.52. G. Free and W. von Füner, assrs to Bad. Anilin- & Soda-Fabr. Process for converting gasolines containing naphthenic hydrocarbons into knockproof fuels.

Ger.P. 849,465, 17.7.52. G. Free and W. von Füner, assrs to Bad. Anilin- & Soda-Fabr. Process for converting gasolines containing naphthenic hydrocarbons into knockproof fuels.

Ger.P. 848,986, 10.7.52. H. Bähr, assr to Bad. Anilin- & Soda-Fabr. Method for producing fuel oil.

BrennstChemie, 1952, **33** (15–16). R. T.

Gas Oil and Fuel Oil

621. Heat and mass transfer in the combustion of liquid fuels. D. B. Spalding. *General Discussion on Heat Transfer, Inst. Mech. Engrs*, Sect. IV, 345–8, Sept. 1952.—Types of flame and conditions for transition are described, and types of flames are illustrated. Experiments on open-wake flames are described, and the apparatus used is shown in a diagram. The conclusions reached are: (1) a cylindrical surface of kerosine at right angles to an atmospheric air stream burns with an open-wake flame at a rate expressed by $Mc/k = 0{\cdot}16Re^{1/2}$ for $300 < Re < 6000$; (2) the drag of such a cylinder is less than that of a similar cylinder with no flame by an amount proportional to the Reynolds number: (3) Kerosine surfaces formed on cylinders with poor internal heat condition properties behave anomalously, giving higher combustion rates and smaller drag reductions; (4) the combustion rate in an open-wake flame is determined largely by the balance between heat gained and lost over the trailing and leading surfaces, but secondary factors also play a part. W. H. C.

622. Luminosity in fuel oil flames. I. I. Berenblut. *General Discussion on Heat Transfer, Inst. Mech. Engrs, Sect. IV*, 349–51, Sept. 1952.—This paper deals only with the radiation due to floating solid bodies; although termed the luminous component of the radiation, its main contribution to heat flow is in the infra-red region of the spectrum. From experiments on burning 5000 sec visc fuel in a gas-turbine, and particle size determination, it is assumed that carbon is formed by two distinct processes: (1) resulting from over-rich mixtures or chilling when the lighter hydrocarbon vapours are burning; (2) due to cracking of the heavier fractions before vaporization can occur. The very small particles of average size 0·05 μ due to vapour phase cracking, presumably, are present in every type of luminous flame, whereas the larger ones are there if the fuel contains a sufficient proportion of heavy fractions. It can be shown quite simply that stack solids (size 1 to 50 μ dia) radiate almost entirely as black-body sources, but the numbers present, even when the heaviest fuels are burnt, are not sufficient to influence the radiation of the flame. The seat of luminous radiation is therefore to be found in minute particles, large in number with low emissivities as single particles, but radiating as a mass having an appreciable effective emissivity. W. H. C.

Lubricants

623. H.D. lubricating oil specifications. Anon. *Petrol. Times*, 23.1.53, **57**, 81.—Standard B.S. 1905: 1952 recently issued by British Standards Institution is discussed. This Standard specified use of American test engines. G. A. C.

624. Some experiments on the influence of a solid phase on the oxidation of low viscosity mineral oil. D. J. W. Kreulen. *J. Inst. Petrol.*, 1952, **38**, 445–8.—It has been shown that the presence of a solid phase affects both the length of the induction period and the rate of oxidation of a mineral oil. Solids such as sand, anthracite, glass, retort carbon, and carborundum have been found effective. The nature of the phenomenon is not known. A. R. W. B.

625. Dependence of viscosity of lubricants on pressure on the basis of available experimental measurements. W. Ruppert. *BrennstChemie*, 1952, **33** (15–16), 273–8. (*Report from Carl-Engler and Hans-Bunte Inst. for mineral oil and coal research, Techn. High School, Karlsruhe*, Dec. 1951.)—Kiesskalt's law on the dependence of visc of lub oils on pressure is confirmed generally by the work of others. Deviations may rest partly on errors in measurements or may be explained by structural changes in the oils caused by pressure changes. The visc–pressure behaviour of the oils is clarified by

comparison of the Kiesskalt law with other related laws. For this a general formulation for a large number of natural laws is applied. Advantages of this procedure for practical calculation are shown, and by virtue of examples special conclusions are drawn. The most important relevant laws are tabulated. Deviations from Kiesskalt's law occurring at sp pressures or in limited pressure ranges can be traced to mol re-arrangements. For small deviations which depend on vol changes obtaining in large intervals, energy intervals must replace pressure intervals. Kiesskalt's law is only a borderline case of a more general law which lub oils, other liquids, and ideal gases obey. In ranges in which the vol does not change and no re-arrangement occurs it applies strictly. It becomes more inaccurate as the influence of vol change increases. Seventeen references. R. T.

626. Phosphorus in the lubricants field. C. V. Smalheer and T. W. Mastin. *Petrol. Process.*, 1952, **7**, 1780–4.—The role of phosphorus and its compounds in lubricant developments, relating to the reciprocating internal combustion engine, and its use to provide motive power, through the appropriate transmission devices, for all vehicle types is described and discussed. The history and importance of phosphorus compounds in the lubricants industry are also reviewed.

The two most commercially significant groups of phosphorus-bearing additives developed in the last decade are : metal salts of di-thiophosphoric acid diesters, and phosphorus-bearing organic compounds. The metal salts are soluble in hydrocarbon oils, and they retard corrosion effectively by building up a protective film ; in addition, they reduce the rate of oxidn of lubricating oils. Methods of synthesizing these additives are given, and the patent literature on the subject is extensively reviewed.

J. W. H.

627. On the influence of metal, especially copper on the oxidation of white oil. D. J. W. Kreulen. *J. Inst. Petrol.*, 1952, **38**, 449–57.—Previous work carried out by the author on this subject is reviewed. With copper present when white oil is heated with oxygen at 100° C the induction period is shorter the greater the amount of copper, until a point is reached where the induction period is zero. It reappears in the presence of larger quantities of copper, and increases as copper content increases.

It is deduced experimentally that the part of the curve where the induction period decreases with copper content is that of an adsorption phenomenon, the adsorption of antioxidants on the copper. The reappearance of an induction period is probably an indication of the breaking of reaction chains. It is evident that copper only exerts a catalytic effect on the oxidation of white oil at high concentrations of copper.

A. R. W. B.

628. The deterioration of transformer oil. Pt III. Assessment and improvement of oil stability. L. Massey. *J. Inst. Petrol.*, 1952, **38**, 361–93.—Difficulties encountered in the operation of the transformer-oil oxidation test specified in BS 148 are described in detail, and the results of varying the conditions of test are shown in a series of graphs and tables.

The need for oils of unproved stability is discussed, and it is shown that for ventilated transformers operating under severe conditions the use of oils of improved stability may be advantageous. The most promising form of oil improvement appears to be offered by oxidation inhibitors. While the BS 148 test is not suitable for complete assessment of an inhibited oil, it is thought that an inhibited oil must at least show negligible sludge and acidity when tested by this method.

The catalytic power exerted by different forms of copper has been studied, and tests are also reported which prove that some varnish films baked on copper test panels permit the migration of copper through the varnish film to the oil. A. R. W. B.

629. Hydrodynamic theory in gear lubrication. A. Cameron. *J. Inst. Petrol.*, 1952, **38**, 614–22.—Equations are developed to explain some of the phenomena of gear lubrication.

Other associated problems, such as the effect of oil temp and increase of viscosity with pressure and that of metal deformation, are also discussed. It is concluded that hydrodynamic theory does explain a number of features of gear lubricants.

A. R. W. B.

630. Gear tooth wear. G. I. Finch and R. T. Spurr. *J. Inst. Petrol.*, 1952, **38**, 623–4.—A theory is put forward to explain the mechanism of gear tooth wear. A. R. W. B.

631. Criteria governing scuffing failure. F. T. Barwell and A. A. Milne. *J. Inst. Petrol.*, 1952, **38**, 624–32.—No reliable criteria for scuffing failure were found in experiments on reciprocating motion, but for continuous motion the product of load, coeff. of friction, and square root of speed was found to correlate quite well. Scuffing load was also shown to depend on the method used to finish the surfaces.

It is concluded that gears should be designed to establish fluid-film lubrication conditions, but if this is not possible attention to surface finish and material may enable higher loads to be carried. A. R. W. B.

632. Some factors affecting gear scuffing. H. D. Mansion. *J. Inst. Petrol.*, 1952, **38**, 633–45.—A description is given of the IAE 3¼-inch gear-lubricant testing machine and of its development. The results of tests carried out with this machine in order to study various problems are reported and discussed. In particular, experiments have been carried out to determine the influence of: (1) the visc and temp. of plain mineral oils on scuffing loads; (2) the chemical nature of the oil; (3) E.P. additives; (4) gear tooth materials and the nature of surfaces. A. R. W. B.

633. The effect of variation of viscosity with pressure on the load carrying capacity of the oil film between gear-teeth. E. McEwen. *J. Inst. Petrol.*, 1952, **38**, 646–50.—It is suggested, as a result of a theoretical investigation, that gear-tooth-surface load-capacity formulæ should consist of two parts: (*a*) a region of fluid film lubrication in which surface failure is by pitting due to fatigue, and (*b*) a region of boundary lubrication in which surface failure is by scuffing. A. R. W. B.

634. Note on performance of graphited oil. E. A. Smith. *J. Inst. Petrol.*, 1952, **38**, 650–2. A. R. W. B.

635. The wear and pitting of bronze disks operated under simulated worm gear conditions. L. S. Evans and R. Tourret. *J. Inst. Petrol.*, 1952, **38**, 652–67.—A theory is put forward to account for the mechanism of wear under mixed hydrodynamic–boundary lubrication conditions, suggesting that surfaces become sufficiently brittle by work-hardening for small particles to become detached. Pitting is initiated by either surface or internal cracks or both. A lubricant of high viscosity without any E.P. additive is suggested as being desirable for bronze worm gears to give low wear and long life before pitting occurs. A. R. W. B.

636. The development of a test method for gear lubricants on the IAE machine. The Mechanical Tests of Lubricants Panel of Standardization Sub-committee No. 5. *J. Inst. Petrol.*, 1952, **38**, 705–11.—The IAE 3¼-inch centres gear rig is a satisfactory instrument for rating the load-carrying abilities of straight and mildly doped oils, but has been found unsuitable for hypoid type oils.

The repeatability of the test is dependent to some extent upon the operator's ability to recognize scuffing, but it is suggested, from a statistical analysis of results, that the mean of four results will probably be within ± 15% of the true result. A. R. W. B.

637. From test machine to gear-box: Problems associated with the translation of laboratory test results into predictions of field service performance of gear lubricants. J. R. Hughes. *J. Inst. Petrol.*, 1952, **38**, 712–18.—Present laboratory methods for evaluating the load-carrying capacity of a gear lubricant are discussed briefly and their limitations pointed out. A more fundamental approach to the evaluation of gear lubricant performance is advocated. A. R. W. B.

638. Road and laboratory wear tests of gear oils. H. L. Bingham and J. C. Withers. *J. Inst. Petrol.*, 1952, **38**, 718–28.—A fair correlation has been shown to exist between wear tests carried out in the laboratory and data obtained from the rear axles of twelve saloon cars operating under ordinary conditions. An assessment of rear axle wear was obtained by measuring the iron content of the used oil, the laboratory test machine used was the Four Ball. A. R. W. B.

639. Production of lubricant test gears. R. D. B. Stone. *J. Inst. Petrol.*, 1952, **38**, 728–32.—The method by which fifteen- and sixteen-tooth 5-DP gears for the IAE 3¼-inch centres machine are manufactured is described. A. R. W. B.

640. The testing and performance of lubricants for high-speed gears. J. Greenwood and R. W. Morton. *J. Inst. Petrol.*, 1952, **38**, 732–46.—An analysis of some of the variables involved in the IAE gear machine test has been carried out. It is concluded that the machine is of value for the testing of mineral or synthetic type lubricants for critical conditions such as are met in lubricating high-speed heavily loaded gears. The original IAE test procedure has been modified slightly, and these changes are described. A. R. W. B.

641. Developments in the specification and testing of lubricants for hypoid axles with particular reference to a full-scale British procedure. A. Towle. *J. Inst. Petrol.*, 1952, **38**, 747–62.—The requirements of the MIL-L-2105 test and the test procedures are described. A description is also given of a British high-torque test with a Vanguard axle which has been accepted by the American Army Ordnance Reviewing Committee as an alternative to their own specification.

The possible types of failure of hypoid gears are outlined. A. R. W. B.

642. The testing and selection of gear lubricants. H. J. Watson. *J. Inst. Petrol.*, 1952, **38**, 763–74.—A disk machine is described for testing lubricants which is capable of simulating any desired combination of slide–roll ratio. The results obtainable from standard test procedures with this machine are discussed and their application in selecting gear lubricants outlined. A. R. W. B.

643. Service tests in rear axles of buses and trolley buses. H. G. Styles and A. T. Wilford. *J. Inst. Petrol.*, 1952, **38**, 775–82.—The results of service tests on inhibited oils are discussed. A. R. W. B.

644. Effects of solid inclusions in sleeve-bearing oil supply. H. G. Rylander. *Mech. Engng, N.Y.*, 1952, **74** (12), 963.—Apparatus for testing single sleeve bearings is described and illustrated. Test bearings were steel-backed, 2·168 inches I.D. × 1 inch long with a lead-base babbitt thickness of 0·020 inches. The shaft was SAE4142 steel, with a hardness number of 350 Brinell, and ground to a surface roughness of 16 micro-inches r.m.s. Load was applied hydraulically. SAE30 oil, at a temp. of 140° F, was used as a lubricant, and various combinations of particle size and concentration of inclusions in the lubricant were tested under varying speeds and loads, ZP/N ranging from 5 to 100. It was found that the presence of graphite and molybdenum sulphide in the oil produced no improvement in bearing operation, but increased concentrations of graphite increased the oil pressure required to maintain constant oil flow. Hard particles must be larger than min oil-film thickness to cause appreciable wear, and wear may take place without large increase in bearing temp. The author recommends that to safeguard bearings, filtration should remove particles considerably smaller than 25 μ. Three refs. T. T.

645. Regeneration of motor lubricants in U.S.S.R. Anon. *Nafta (Krakow)*, 1952, **8**, 26 (from *Automobil*, 1950, (7)).—Small regenerating stations of type BIMZ-2 can cope with each 150 kg of oil per shift. Cost equals half of the price of fresh oil. Schematic flow diagram given. M. S.

646. Patents. U.S.P. 2,596,084 (17.7.46; 6.5.52). P. E. Weimer, assr to U.S.A. (U.S. Atomic Energy Commission). A perfluorinated oil suitable for use as a lubricant contains 74 to 76% F, has b.p. 100° to 250° C/10 mm Hg abs, and is obtained by reacting a polyalkyl condensation product of a dinuclear aromatic hydrocarbon in vapour phase with AgF_2 or CoF_2 at 200° to 400° C.

U.S.P. 2,597,908 and 2,597,910 (28.2.50; 27.5.52). H. R. Stewart and W. M. Thaw, assrs to California Research Corpn. Production of lub oil by chlorinating pet wax to: (*a*) >20 wt % chlorine content, (*b*) at <300° F to <16 wt % chlorine content, and contacting the product with <5 wt % of a silica–alumina catalyst at 600° to 725° F to effect complete removal of chlorine and produce a substantially saturated oil.

U.S.P. 2,597,750 (23.2.49; 20.5.52). E. N. Roberts and L. W. Mixon, assrs to Standard Oil Co. (Ind.). Lub oil containing 0·001 to 10% of a metal salt of the product obtained by reacting 1 to 50% of a phosphorus sulphide with a normally liquid hydrocarbon at 200° to 600° F, neutralizing the reaction product with a basic metallic compound and reacting the salt with 0·5 to 40% of a quinone at 100° to 400° F.

U.S.P. 2,595,819 (14.1.50; 6.5.52). W. H. Smyers and D. W. Young, assrs to Standard Oil Development Co. Mineral lub oil containing dissolved 1 to 20 wt % of a reaction product of P_2S_5 with sperm oil containing dissolved *ca* 20 wt % of a styrene–*iso*butene copolymer having a combined styrene content of *ca* 50%, intrinsic visc 0·5 to 1·5, said reaction product containing 1 to 10 wt % S and 0·1 to 5 wt % P.

U.S.P. 2,597,838 (9.7.49; 20.5.52). W. Lowe, W. T. Stewart, and J. O. Clayton, assrs to California Research Corpn. A selenium-containing lub oil corrosive to silver contains a 2-mercapto thiazine, wherein $\geqslant 4$ of the ring carbon atoms carry aliphatic groups, each of $\geqslant C_4$, to inhibit Ag_2Se formation.

U.S.P. 2,597,045 (16.1.47; 20.5.52). D. F. Wilcock and M. M. Sprung, assrs to General Electric Co. Lub oil consisting essentially of a liquid polysiloxane *A* containing 1·9 to 2·67 hydrocarbon groups per Si atom and 3 to 15 wt %, based on *A*, of a mixture comprising: (*a*) a chlorinated saturated aliphatic monohydric alcohol ester of a C_{2-5} saturated fatty acid and (*b*) a compound $HS.CH_2COOR$, wherein R = C_{2-8} alkyl, (*b*) forming 30 to 70 wt % of (*a*) + (*b*).

U.S.P. 2,597,708 (30.12.48; 20.5.52). A. Crosswell, assr to American Cyanamid Co. Antistatic textile oil comprising an aq dispersion of a guanidine salt of mono C_{12-18} alkyl sulphuric acid ester and a lubricant consisting of a C_{2-5} alkyl ester of a C_{12-18} fatty acid.

U.S.P. 2,595,556 (14.6.48; 6.5.52). H. J. Worth, W. H. Page, and J. F. Cook, assrs to Union Oil Co. of California. Lub composition containing a neutral complex produced by reacting a mixture of 1 equiv of a metal soap and 0·1 to 3 equiv of a basically reacting metal compound with an ammonia derivative of carbonic acid. (U.S.P. 2,595,557 relates to similar compositions in which an alkali metal soap and an alkali metal compound are reacted with the ammonia derivative.)

U.S.P. 2,598,154 (21.8.47; 27.5.52). G. C. Bailey and W. B. Whitney, assrs to Phillips Petroleum Co. Manufacture of lub grease by dispersing a metallic soap in a hydrocarbon lub oil with heating and agitation, chilling to form a hard friable gel in some free oil, removing part of the free oil, and working the residue to constant consistency.

U.S.P. 2,597,018 (18.5.48; 20.5.52). R. L. Merker and C. R. Singleterry. Lub oil thickened with up to 45 wt % of a phthalocyanine to form a gel. V. P. P.

Ger.P. 849,159, 10.7.52. L. Arthner and G. Balle, assrs to Farbwerke Hoechst, formerly M. Lucius and Brüning. Process for raising visc of lubs containing oil, corrosion preventives, etc.

Ger.P. 849,468, 17.7.52. O. Wahl, W. Schommer, and G. Schrader, assrs to Farbenfabr. Bayer. Higher-pressure lub.

Ger.P. 850,051, 24.7.52. H. Kölbel and D. Ullmann, assrs to Steinkohlenbergwerk Rheinpreussen. Method for producing high-pressure-resistant solid lub greases.
BrennstChemie, 1952, **33** (15–16). R. T.

Bitumen, Asphalt, and Tar

647. Classification of bitumens in asphalt technology by certain rheological properties. Pt III. The practical value of viscosity number and related indices as compared with other established method of characterization. S. L. Neppe. *J. Inst. Petrol.*, 1952, **38**, 344–60.—A study of the penetration index curves of Pfeiffer and van Doormal and of Holmes, Collins, and Child has been made on data obtained from the author's experimental work, and the limitations of these two systems are discussed. The improvements of the author's method of Soft Pt–Visc. No. are pointed out, and some practical advantages of this system described. A. R. W. B.

648. Classification of bitumens in asphalt technology by certain rheological properties. Pt IV. Criticism of certain established fluidity factors and derivation of more rational indices. S. L. Neppe. *J. Inst. Petrol.*, 1952, **38**, 458–71.—Inherent errors in the Fluidity Index of Holmes, Collins, and Child are pointed out and a modification suggested to remove certain irregularities. The Zapata Fluidity Factor is shown to

be unsound. Analytical data for numerous samples are presented, and from these the author has developed a rational Fluidity Characterization Factor based on a graphical study of absolute viscosity–temp relationships over a wide range of temp.
A. R. W. B.

649. Classification of bitumens in asphalt technology by certain rheological properties. Pt V. Experimental and graphical studies involving changes in penetration and ductility with temperature. S. L. Neppe. *J. Inst. Petrol.*, 1952, **38**, 532–57.—Analytical data on the effect of temp on bitumen penetration and ductility have been obtained on numerous samples. A "Penetration Susceptibility Factor" and a "Ductility Susceptibility Factor" are defined, and composite diagrams have been prepared for six different classes of bitumen which show simultaneously the relation to temp of penetration, ductility, and softening point performance. Once the characteristics have been established for any class of material, the relevant chart can be used directly for deducing the penetration or ductility at any temp for any member of that series.
A. R. W. B.

650. Newer experience and information in asphalt and tar road construction. G. Zichner. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (9), 223–8; **3** (10), 267–70.—Brief sketch of papers presented at meetings of the active group Asphalt and Teerstrassen in September 1951 in München, in October in Bad Dürkheim, published by Kirschbaum, Bielefeld as a brochure, price DM 6. R. T.

651. Determination of adhesive power and scratch resistance in prepared tars. A. Scheuerer. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (9), 235–8.—The technique described in this journal (1952, **3** (2), 29; (cf. Abs. 2473—1952)), is applied to a study of adhesive power and scratch resistance of pitch-tar oil films. Comparative tests on seven mixtures containing 78% pitch and the medium, heavy, and anthracene oils dist from road tars, alone and in various combinations, are reported. For classification as road tars, based on adhesive power, the scheme proposed at the *Road Construction Session*, Constance, Apr. 1952, is used. Scratch resistance tests after 3, 7, 15, 24, 69, and 98 days' air exposure show the relative hardening and visc corresponding to oil type and mixing relationships. Mallison's work on tar redistillation and distribution of constituents into material groups (cf. this *Journal*, 1950, **1** (12), 314) is confirmed by results for a tar redist at both 300° and 350° C. Effects of the thermal treatments on visc, setting rate, adhesive power, and scratch resistance of prepared tars is determined by comparing results for the redist tars with those for the original tar. In the prepared tars the oily portion is effective for a shorter time than in the original tar, an important factor in road construction. The scratch resistance reproduced in curves gives insight into the course of vaporization of the oils and increase in hardening by a process, simple and rapid, compared with conventional procedure. Explanatory charts are presented. R. T.

652. Bitumen emulsions, their types, and applications in road construction. E. Flister. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (9), 239–41; **3** (10), 270–1.—Pt I deals with appropriate uses of bitumen emulsions conforming to draft spec DIN 1995 as reproduced. Sp applications of unstable, semi-stable, and stable emulsions are given. Pt II deals with highly visc emulsions and stability of emulsions in storage, which should be eight weeks min. Special emulsions not specified in DIN 1995 are discussed.
R. T.

653. Simple procedure for accurate measurement of the setting time of road tars. H.-G. Franck and O. Wegener. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (10), 251–8.—Increase of visc of road tars during setting, which is synonymous with increase in adhesiveness, is generally conditioned by vaporization of the light oil. Increase in visc through oxidn and polymerization reactions may be ignored. A relationship between vaporization loss and visc increase is derived, and from it a procedure for measuring the setting rate of road tars, is developed, by simple measurement of the vaporization loss. Numerous charts are presented. Results determined experimentally confirm those calculated by the derived equations. R. T.

654. Investigations on tar and bitumen and their miscibility with the aid of thin films on water surfaces. K. Letters. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (10), 258–61; **3** (11), 284–8.—Pt I deals with properties of tar and bitumen colloidal systems which

are expressed in the behaviour of their films. Tests are reported on films 0·8 to 1 μ thick formed as described, on water, consisting of 50% bitumen and 60% coal tar dissolved in a mixture of 90% chlorobenzene and 10% tetralin. The time required for a 0·216-g lead ball to fall through the surface is taken as a measure of the film strength in sec. Tar and bitumen give characteristic ageing curves; tar films become brittle in three to four days according to the load, but strengthen on warming. Bitumen curves show much higher stability, and temp increase causes a reversal in strength. The phenomena are discussed. Thirteen literature references.

Pt II. A film investigation of a series of five mixtures of tar 80/125 with bitumen B45 in bitumen gradations of 10% up to 50% is discussed. The appearance of the films is shown in photomicrographs. Three reaction zones are indicated. A review of all the results for the tar–bitumen mixtures shows that the true procedure may be expressed in a main reaction:

Bitumen oils low-mol. + Tar resins medium and high-mol. ⟶ Flocculations medium and high-mol tar resins

The reaction runs apparently with greater intensity even if, according to conditions, in somewhat different forms.

Zone I: bitumen addition 0 to 20%. The bitumen oils penetrate the tar homogeneously and form, corresponding to their amount, weakly swelled deposits with increase of mol size and a resultant quicker setting time and increase of film strength.

Zone II: bitumen addition 30 to 40%. Tar resins flocculate; no film formation possible.

Zone III: bitumen 50 to 100%. The tar resins flocculate immediately through the excess of bitumen oils. These systems age like bitumen films. Indications for use of these mixtures in road construction are discussed. Nine literature references. R. T.

655. New draft of Part I of DIN 1995: bitumen binders for road construction. Anon. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (11), 293–4. (*Drawn up by the active group Asphalt und Teerstrassen of the Research Association for road affairs.*)—This draft with Pt II, not yet published, will form the new DIN 1995. Requirements are given in detail, with revisions in bold type. R. T.

Special Hydrocarbon Products

656. Role of kerosine in intensifying the coal flotation process and improving concentrate quality. D. S. Emel'yanov. *Ugol*, 1952, **27**, (4) 37–40.—Improvement in extraction of coal in flotation process can be effected by use of kerosine together with flotation oil (*e.g.*, pine oil, middle distillate). Kerosine gives best effect if it is added 1 to 2 min after start of flotation and not at beginning thereof. Successive introduction of flotation oil and kerosine can greatly decrease duration of flotation process. Such use of kerosine together with flotation oil can reduce consumption of latter and decrease ash content of coal. Kerosine can be used with usual foam-producing agents, *e.g.*, cresol. Results of numerous tests are given, typical quantity of kerosine used is about 1 kg/ton. V. B.

657. Petroleum waxes dominate field. B. H. Clary. *Oil Gas J.*, 12.1.53, **51** (36), 103.—A general review of paraffin and microcrystalline waxes is given, and a table shows physical properties of the two types.

Waxes made by chemical reaction for specific purposes are also briefly considered. G. A. C.

658. More efficient ethylene production. C. C. King and J. Warburton. *Petrol. Process.*, 1952, **7**, 1644–7. (Based on paper *Ethylene Production and Recovery*, presented at Oklahoma State Mtg. Amer. Inst. Chem. Engrs, 11 Oct. 1952 at Tulsa Univ.)—Because of the large present demand for ethylene, to be put to such uses as polyethylene plastic, ethylene glycol, and tetra-ethyl lead production, several plants have been built, and more are being constructed to recover ethylene from refinery gases and in other cases to produce ethylene by pyrolysis methods.

The principal features of the new process described in detail and illustrated by means of flow sheets, are: (1) vapour phase cracking with superheated steam; (2) the recovery

of waste heat by quench boilers. This new process can produce ethylene of 99·9% continuously, and the recovery of the ethylene in the low temp fractionation system is better than 97%.

The de-methanizer employed is different from others that are used in the recovery of ethylene. It is operated at low pressure, in the region of 100 to 150 p.s.i., and the feed is chilled to −150° F, with the reflux condensing at −200° to −210° F.

The flow diagrams for the refrigeration of propylene, ethylene, and methane are given. J. W. H.

659. Rationalization and improvements. I. Lasek. *Nafta (Krakow)*, 1952, **8**, 51–8.—Pt 3 includes a method of colorimetric determination for highly refined odourless kerosine. Its colour is due to aromatics and unsaturateds, which with 40% formaldehyde give colour similar to that of aqueous solution of 5% $Na_2[(NO)Fe(CN)_5].2H_2O$ + 0·015% alk. blue. These kerosines, whose samples give colour equivalent to that of aqueous solution of less than 5% $Na_2[(NO)Fe(CN)_5]2H_2O$ + 0·015% alk. blue have been found to be odourless.

Pt 4 gives administrative news. M. S.

660. Patents. U.S.P. 2,596,102 (Ger. 21.9.49; 13.5.52). H. F. Rickert and O. Bayer, assrs to Farbenfabr. Bayer. Preparation of *cyclo*hexene by heating a halogenated *cyclo*hexane with carbazole, *N*-alkyl carbazole, or halogenated derivatives thereof.

U.S.P. 2,597,201 (14.11.49; 20.5.52). J. Swiss and G. W. Hewitt, assrs to Westinghouse Electric Corpn. A liquid composition suitable for use as a water washable particle–adherent coating in dust precipitators comprises in parts by weight 60 to 95 of a hydrocarbon oil of visc 1000 to 5 cs and 40 to 5 of a mixture of mutually sol nonionic surface active agents, at least one being readily sol in oil, while another is insoluble in oil but sol in water.

U.S.P. 2,596,101 (16.8.46; 13.5.52). L. Pritzker. Coating composition, consisting essentially of a tough, rubber-like, resilient resin of pet long chain unsaturated hydrocarbons produced by air blowing at 450° to 575° F the viscous material pptd by propane dewaxing of straight cylinder stock from a paraffin base oil, a non-polar volatile solvent therefore sufficient to produce a gel, and a polar solvent to give paint fluidity.

U.S.P. 2,595,911 (29.12.44; 6.5.52). D. W. Young and W. J. Sparks, assrs to Standard Oil Development Co. Coating composition comprising 97 to 99·75% of paraffin wax, m.p. 110° to 195° F, having dissolved therein 0·25 to 3 wt % of a high mol. wt. styrene–*iso*butylene copolymer having a combined styrene content of *ca* 2 wt % and an intrinsic visc of 0·6 to 3·0.

U.S.P. 2,597,871–2 (20.9.47; 27.5.52). R. K. Iler, assr to E. I. du Pont de Nemours & Co. (*a*) Wax emulsion polishing composition containing dispersed silica particles of 1 to 100 $\mu\mu$ size in amount sufficient to impart skid resistance to the dried film. (*b*) Aq dispersion of a water-insoluble organic polymer and <2% by weight, based on polymer, of an alkali stabilized colloidal silica of particle size <0·03 μ, the alkali being outside the particles to retard condensation between them.

U.S.P. 2,598,257 (29.5.48; 27.5.52). J. B. Hill and S. W. Ferris, assrs to Sun Oil Co. Wax product for production of laminates required to withstand high temp, having m.p. *ca* 190° F, ASTM, per *ca* 20, and which do not increase the translucency to visible light of non-coated sulphite paper when pressed in contact therewith for 24 hr in an air bath at 120° F, the translucency of the paper being increased by oil thereon. The wax product is produced, *e.g.*, by dewaxing a heavy lub residuum to produce a wax of m.p. 160° F and visc 91 sec, which is distilled to 50% overhead to give a bottoms fraction m p. 177° F and visc 158 sec, which is then de-oiled with MEK–benzol–toluene mixture.

U.S.P. 2,596,679 (24.8.50; 13.5.52). H. J. Hagemeyer, assr to Eastman Kodak Co. Preparation of a pesticide by reacting under anhydrous conditions 1 to 6 parts of a compound $KPO(OR)_2$, wherein R = C_{1-4} alkyl, K = lower alkyl or aryl, with 1 part of P_2O_5.

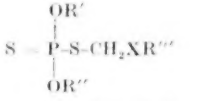
U.S.P. 2,597,534 (Ger. 7.5.49; 20.5.52). G. Schrader, assr to Farbenfabr. Bayer. Neutral esters of general formula $(R_1O)(R_2O)PO.S.alk.SR$, wherein R_1 and R_2 = lower alkyl radicals; alk = lower alkylene chain; R = lower alkyl, phenyl, or lower alkyl substituted phenyl radical.

U.S.P. 2,598,561 (3.10.49; 27.5.52). M. Kleiman, assr to Velsicol Corpn. Preparation of Chlordane by reacting 4 : 7-methano-3*a* : 4 : 7 : 7*a*-tetrahydro-4 : 5 : 6 : 7 : 8 : 8-hexachlorindene with SO_2Cl_2 in presence of a Freidel-Crafts catalyst (Insecticide).

U.S.P. 2,595,217 (25.3.48; 6.5.52). T. Parr and M. Zakheim, assrs to Pennsylvania Salt Manufacturing Co. Insecticidal dust and spray base prepared by mixing molten chlorinated camphene with a minor proportion of an oil (vis $<$ 200 SUS/100° F; $<$ 90% boiling $>$120° C) and agitating the mixture with a solid absorbent diluent.

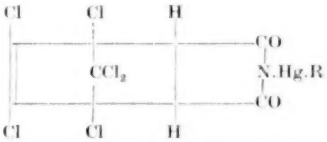
U.S.P. 2,595,371 (2.5.47; 6.5.52). R. W. Scanlan and H. R. Cunningham, assrs to Phillips Petroleum Co. Insect repellent ointment comprising hydrogenated rotenone and 2-amino-2-methyl-1 : 3-propanediol.

U.S.P. 2,596,076 (26.3.48; 6.5.52). E. O. Hook and P. H. Moss, assrs to American Cyanamid Co. Insecticidal composition containing a dithiophosphate ester of the general formula



wherein R′ and R″ = $C_{>4}$ alkyl or chloralkyl; R‴ = aliphatic hydrocarbon radical; X = O or S.

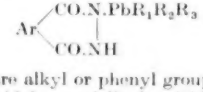
U.S.P. 2,598,562 (3.1.51; 27.5.52). M. Kleiman, assr to Velsicol Corpn. An *N*-Mercuri—1 : 2 : 3 : 6-tetrahydro-3 : 6-endomethano-3 : 4 : 5 : 6 : 7 : 7-hexachlorophthalimide of formula



wherein R contains $<C_{22}$ and is alkyl, lower alkenyl, carbocyclic aryl of 1 or 2 rings, *cyclo*alkyl where ring contains 5 to 6 C, or aralkyl where aryl portion is carbocyclic and mono-nuclear. Fungicides.

U.S.P. 2,596,107 (4.12.48; 13.5.52). M. Silverman and B. Heinemann, assrs to Schieffelin and Co. Fungicide—3-carbalkoxy-4-hydroxy benzocoumarin.

U.S.P. 2,595,798 (28.10.50; 6.5.52). W. B. Ligett, R. D. Closson, and C. N. Wolf, assrs to Ethyl Corpn. New compounds of the general formula



wherein R_1, R_2, and R_3 are alkyl or phenyl groups and Ar is an *o*-phenylene radical. The compounds have biocidal, especially fungicidal, activity.

U.S.P. 2,596,089 (23.9.49; 13.5.52). W. W. Allen, assr to American Chemical Paint Co. Esters of 2 : 4-dichloro- and 2 : 4 : 5-trichloro-phenoxyacetic acid with an ether alcohol of the formula $RO.CH_2.CH_2.O.CH_2.CH_2OH$, wherein R = lower alkyl, benzyl, or phenyl. The esters are used as herbicides, and are claimed to be free from the "biological volatility" which causes 2 : 4-D and 2 : 4 : 5-T acid to kill or injure vegetation to which it has not been applied.

U.S.P. 2,598,121 (21.6.48; 27.5.52). L. S. Hannibal, assr to Shell Development Co. An injector for injecting volatile fluids, *e.g.*, anhydrous ammonia, into soil, having a shank, a spear point, lateral wings in the rear of the spear point to make lateral fissures in the soil, and ducts to discharge the fluid laterally into the fissures.

U.S.P. 2,596,929 (31.1.48; 13.5.52). J. F. Kagy and R. R. McPherson, assrs to Dow Chemical Co. A solution of ethylene bromide in water is introduced into soil of the rhizosphere of a plant in amount of 1·125 to 18 lb./yd^3 of soil, to improve plant growth.

V. P. P.

Ger.P. 848,957, 10.7.52. C. Seidler, H. Wille, and H. Kaffer, assrs to Ges. f. Teerverwertung m.b.H. Process for intermittent or continuous production of odourless, clear coumarone resins.

Ger.P. 848,958, 10.7.52. C. Seidler, H. Wille, and H. Kaffer, assrs to Ges. f. Teerverwertung m.b.H. Method for production of coumarone resins.

BrennstChemie, 1952, **33** (16–15), R. T.

Derived Chemical Products

661. Petroleum chemicals reviewed. R. F. Goldstein. *Petrol. Times*, 23.1.52, **57**, 58.—U.S. production figures for 1950–51 are tabulated and future of U.S. petroleum chemicals industry reviewed. A short account of present state of developments in Europe is also given. G. A. C.

662. Aliphatic building blocks for petrochemical textiles. P. W. Sherwood. *Petrol. Process.*, 1952, **7**, 1633–8.—This article covers the availability of aliphatic raw materials for the synthesis of petrochemical textiles at present, and also the expected demand in the future.

Nylon, the pioneer artificial fibre, is primarily a derivative of coal tar, and the raw materials used in its production are wholly aromatic. Other synthetic fibres now appearing on the market, such as Saran, Dynel, Orlon, and Acrilan, are dependent on the petrochemical industry for raw materials. The three main starting chemicals for synthetic fibre production are undoubtedly ethylene, acetylene, and hydrogen cyanide. The availability and production of these raw materials by the petrochemical industry, and the methods in use for their purification, are discussed in detail.

The production of synthetic fibres in the U.S. for 1950 was 156 million lb, this figure is expected to rise to 487 million lb by 1953, and as high as 975 million lb by 1960. J. W. H.

663. Phillips synthesize pyridines. J. M. Folz, J. E. Mahan, and D. H. White. *Petrol. Process.*, 1952, **7**, 1802–3.—The first commercial plant for the synthesis of methyl vinyl pyridine (MVP) from petroleum raw materials has been erected in Texas, U.S.A., by Phillips Chemical Co. The MVP is to be used in fibre production, and an intermediate compound, methyl ethyl pyridine (MEP) is a starting material for Niacin, a B-complex vitamin.

The starting raw materials used are ammonia and acetaldehyde, the acetaldehyde being first converted to paraldehyde in the presence of sulphuric acid as catalyst. The MEP synthesis consists of a liquid phase reaction of paraldehyde with ammonia, with water being split off in the reaction. The MEP is dehydrogenated to MVP with the help of a catalyst.

Carbon steels are used in the construction of the process equipment, and mechanical seals have been used on all vacuum pumps to prevent air leakage into the system. J. W. H.

664. Expansion goals 99·7% filled. Anon. *Petrol. Process.*, 1952, **7**, 1793–1800.—The authorization of $800 million by the U.S. Defence Production Administration to meet production needs on twenty-two critical petrochemicals made from petroleum or natural gas is discussed. Information is given in detailed tabular form on the individual petrochemical projects undertaken by eighty-one different U.S. companies. J. W. H.

665. Aliphatic building blocks for petrochemical textiles. Pt II. The Monomers. P. W. Sherwood. *Petrol. Process.*, 1952, **7**, 1804–10.—This article covers the second step in the petrochemical textile industry from the raw material stage, *i.e.*, the conversion of the primary materials—ethylene, acetylene, and hydrogen cyanide—to the aliphatic monomers which can be polymerized (or co-polymerized) into fibres.

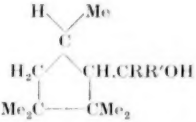
The production of ethylene oxide via chlorohydrin and the methods available for acrylonitrile formation are presented, together with those suitable for vinyl and vinylidene chloride production from dichloroethane.

At the present moment only 7% of the U.S. nation's output of ethylene oxide (710 million lb) is used for acrylonitrile production, but an increase to 17 to 20% of the anticipated output of 1116 million lb is expected by 1962. J. W. H.

666. Patents. U.S.P. 2,595,805 (4.11.47; 6.5.52). C. E. Morrell, N. C. Robertson, and C. S. Carlson, assrs to Standard Oil Development Co. A mixture of <1 normal C_{3-4} alkanol *A* and <1 branched C_{3-5} alkanol *B*, whose aq b.p.s. differ by $<5^\circ$ C is separated by feeding the mixture to an intermediate point of a fractionating column, feeding water to a higher point thereof to produce a liquid reflux containing 85 to 99 mol % water, removing *B* free from *A* overhead and an aq soln of pure *A* as bottoms.

U.S.P. 2,597,009 (28.5.48; 20.5.52). W. E. Lobo and G. T. Skaperdas, assrs to M. W. Kellogg Co. Aq solutions of $C_{<3}$ alcohols are dehydrated by contacting with bromotoluene and/or a halogenated non-aromatic cyclic hydrocarbon.

U.S.P. 2,597,842 (9.5.52; 27.5.52). C. B. Linn, assr to Universal Oil Products Co. A carbinol of formula



wherein R = H, alkyl; R′ = alkyl, *cyclo*alkyl, or aryl. The ethanol derivative is produced by reducing mesityl oxide to desoxymesityl oxide, which on distillation produces an isomeric mixture of pentamethyl*cyclo*pentenyl methyl ketones, which is then reduced with hydrogen in presence of a nickel catalyst.

U.S.P. 2,595,785 (8.10.49; 6.5.52). C. H. Hale, assr to Standard Oil Development Co. C_{6-14} Oxo alcohols containing impurities, including aldehydes and acetals, producing colour when the alcohol is esterified, is purified by extracting the crude alcohol in liq phase with aq NaOH of 1 to 25% concn at $>150^\circ$ F with simultaneous aeration, stratifying the product and separating the alcohol.

U.S.P. 2,595,763 (31.12.49; 6.5.52). C. S. Carlson, W. E. Catterall, and J. H. Staib, assrs to Standard Oil Development Co. A C_{4-20} Oxo alcohol containing sulphur impurities which give rise to coloured products when the alcohol is esterified, is purified by contacting in liq phase with 0·5 to 50 vol % of aq NaOH of 10 to 50 wt % concn, with simultaneous aeration, at 30° to 100° C for 1 to 24 hr, followed by stratification of the mixture and separation of the alcohol layer. In U.S.P. 2,595,786, the extraction temp is 100° to 250° C.

U.S.P. 2,596,507 (17.6.46; 13.5.52). C. W. Perry, assr to Phillips Petroleum Co. Continuous process for HCN synthesis which comprises flowing by gravity a contiguous mass of $\frac{1}{4}$ to 1 inch spherical, refractory non-catalytic pebbles from a heating zone, where they are heated to 1500° to 3000° F by hot gases, to a reaction zone, where they are contacted with a preheated mixture of NH_3 and CO or a low mol. wt. hydrocarbon.

U.S.P. 2,596,421 (12.4.48; 13.5.52). A. C. McKinnis, assr to Union Oil Co. of California. Synthesis of HCN by passing a gaseous mixture of 10 to 17 vol % NH_3, 1 to 15 vol % of $C_{>6}$ hydrocarbon and 10 to 20 vol % O_2 as air, into a synthesis flame maintained by the combustion of said mixture. A mixture of hydrocarbon and oxygen is burnt to form an auxiliary flame surrounding the synthesis flame, which is thus caused to take the form of a thin flat disk, the dimension of which in the direction of its propagation is such that the time of passage of the mixture through the flame is less than *ca* 1×10^{-4} sec. The product gases are immediately quenched.

U.S.P. 2,595,227 (13.1.48; 6.5.52). W. J. Cotton. A mixture of toluene vapour, oxygen, and nitrogen is passed at below ignition temp through an electric field of two crossing discharges exhibiting a luminous region completely confined by gas, one discharge having a frequency of at least 0·065 megacycles/sec, whereby the nitrogen is activated to an oxidation catalyst and the toluene is oxidized to PhCHO and PhCOOH.

U.S.P. 2,595,265 (13.7.45; 6.5.52). R. Johnson, assr to Koppers Co. Inc. Production of methyl naphthyl carbinol and methyl naphthyl ketone by oxidizing ethyl naphthalene with oxygen in presence of a heavy metal salt (Co stearate; Co, Mn or Cr naphthenate; Cu or Mn acetate; Mn carbonate).

U.S.P. 2,598,411 (23.11.48; 27.5.52). W. T. Miller and E. W. Fager, assrs to U.S.A. (U.S. Atomic Energy Commission). Perhalocarbons containing $<C_2$, F_2, and two

different halogens are isomerized by contacting with $AlCl_3$, $AlBr_3$, or mixtures thereof with Sb halides at 0° to 95° C for 1 to 7 hr.

U.S.P. 2,597,698 (18.8.50; 20.5.52). G. B. Bachman and J. V. Hewett, assrs to Purdue Research Foundation. Improved yields of nitrohydrocarbons are obtained by contacting 1 mole HNO_3 with 7 to 8 moles of an aliphatic hydrocarbon in vapour phase at 200° to 500° C in presence of 0·0018 to 0·026 mole of Cl_2, Br_2, or I.

U.S.P. 2,597,027 (27.3.47; 20.5.52). R. J. Passino and L. C. Rubin, assrs to M. W. Kellogg Co. Production of nitroparaffins by cat oxidizing ammonia and contacting the vapours produced immediately upon formation with excess of a gaseous paraffin at slightly below its cracking temp to form the nitroso paraffin, which is further oxidized at a reduced temp to the nitroparaffin.

U.S.P. 2,597,753 (20.4.50; 20.5.52). F. W. Schmitz and R. S. Egly, assrs to Commercial Solvents Corpn. Nitroparaffins are recovered from crude mixtures thereof by washing with aq solutions of alkali metal bicarbonates *A*, dichromates *B*, bisulphites *C*, *A* + *C*, or H_2O_2, *C* only being used with $C_{>2}$ nitroparaffins. A first wash with *B* or H_2O_2 is followed by a second wash with *A* and a first wash with *A* by *C*.

U.S.P. 2,597,497 (19.7.49; 20.5.52). G. G. Joris, assr to Allied Chemical and Dye Corpn. A cumene hydroperoxide decomp mixture containing acetone and phenol is dist with water, taking acetone overhead. The residue, which also contains ≮30% cumene, is extracted with water at ≮85° C, phenol in the organic layer being neutralized and aq phenate separated, while aq phenol layer is extracted with cumene and the extract combined with the acetone distillation residue. The aq phenol layer is then extracted with hydrocarbon solvent and the aq layer recycled.

U.S.P. 2,598,014 (26.7.50; 27.5.52). W. A. Proell, W. B. Chilcote, and B. H. Shoemaker, assrs to Standard Oil Co. Production of sulphonyl chlorides by simultaneously contacting an anhydrous mixture of non-tertiary hydrocarbon disulphide *A*, chlorine, and oxygen in the presence of a catalytic amount of NO_2 at −20° to 50° C under sufficient pressure to maintain *A* in liq phase.

U.S.P. 2,598,013 (26.7.50; 27.5.52). W. A. Proell and W. B. Chilcote, assrs to Standard Oil Co. The induction period which precedes the oxidn of non-tertiary saturated hydrocarbon sulphenyl chlorides or bromides *A* with catalytic amounts of NO_2 at −20° to 30° C to sulphonyl halides *B* is reduced by adding 0·5 to 20 wt % of a partially oxidized *A* containing 2 to 50% of the oxygen required for complete conversion to *B*.

U.S.P. 2,595,907 (30.12.50; 6.5.52). W. M. Thomas and J. A. Price, assrs to American Cyanamid Co. A polymerizable composition comprising a compound *A* of formula

$$CH_2{=}CH.CO.NH.(CH_2)_3.NRR' \text{ (wherein R,R' = } C_{1\text{-}6} \text{ alkyl radicals)}$$

and acrylonitrile *B*, *A* forming 0·5 to 15 wt % of *A* + *B*.

U.S.P. 2,595,625 (21.8.48; 6.5.52). R. J. Agnew, assr to Texas Co. Preparation of mouldable thermosetting resins by copolymerizing at 70° to 120° F in presence of a peroxide catalyst and acetone, an aq dispersion of a mixture consisting of (A) 5 to 35% conjugated alkadiene of 4 to 5 C atoms, and (B) 65 to 95% unsaturated polyester containing ≮3 condensation units per mol formed by esterifying a dihydroxy alcohol with an α-olefinic dicarboxylic acid.

U.S.P. 2,595,575 (15.9.50; 6.5.52). G. E. Ham, assr to Chemstrand Corpn. A dyeable copolymer of 80 to 99 wt % acrylonitrile and 1 to 20 wt % of a compound $CH_2{=}CX.CH_2.O.CH_2.CH(OH).CH_2Y$, wherein X = H, Cl, Me; Y = Cl, Br.

U.S.P. 2,595,848 (27.2.50; 6.5.52). G. E. Ham, assr to Chemstrand Corpn. Dye receptive copolymer of 75 to 98 wt % acrylonitrile and 2 to 25 wt % of a compound of formula :—

$$CH_2{=}\underset{\displaystyle (CH_2)_n}{\overset{\displaystyle H}{\overset{|}{\underset{|}{C}}}}.(CH_2)_m.O.CO.CHXR$$

(wherein X = Cl, Br; R = H or $C_{1\text{-}4}$ alkyl; *m* and *n* = 0 or 1 and *n* ≠ *m*) said co-

polymer having been reacted with an alkali metal salt of a mercapto substituted *N*-heterocyclic compound.

U.S.P. 2,598,424–5 ((*a*) 9.10.46 (*b*) 1.11.46; 27.5.52). C. F. Peters, assr to Velsicol Corpn. Production of resinous compounds suitable for use in coating compositions by reacting *cyclo*pentadiene with: (*a*) tall oil at 400° to 650° F; or (*b*) rosin, abietic acid, polymerized rosin, or rosin esters at 400° to 650° F.

U.S.P. 2,596,091–3 (28.3.50; 13.5.52). P. L. de Benneville, assr to Rohm and Haas Co. (*a*) Preparation of a surface-active compound $R^1R^2R^3ArCH_2(OCH_2CH_2)_nR^4$ by reacting at 80° to 150° C an ether glycol $HO(CH_2CH_2O)_nR^4$ with a halide $R^1R^2R^3ArCH_2X$ in the presence of an equivalent of alkali metal hydroxide, wherein R^1 = C_{6-18} alkyl; R^2 and R^3 = H, Me; R^4 = $C_{>4}$ alkyl; Ar = benzene or naphthalene; n = 6 to 40, and is at least sufficient to ensure water dispersibility; X = Cl, Br. (*c*) As in (*a*) but R^4 = H. (*b*) Preparation of $R^1R^2R^3ArCH_2O(CH_2CH_2O)_nCH_2ArR^1R^2R^3$ by reacting at 80° to 150° C one mole of $HO(CH_2CH_2O)_nH$ with 2 moles of $R^1R^2R^3ArCH_2X$ in presence of 2 moles of alkali metal hydroxide, wherein R^1 = C_{6-18} alkyl; R^2, R^3 = H, Me; Ar = phenyl; n = 12 to 50; X = Cl, Br.

U.S.P. 2,597,437–40 (12.5.51; 20.5.52). G. W. Bodamer, assr to Rohm and Haas Co. Production of ion-exchange resins by polymerizing at 20° to 80° C in absence of oxygen and in the presence of a seed of a previously prepared polymer: (1) a mixture of a monomeric acrylic acid ester and a polyolefin, said mixture containing $<70\%$ acrylic acid, and then hydrolysing the polymer with a solution of a strong base; (2) styrene and then sulphonating the polymer; (3) styrene, then chloromethylating the polymer to produce a product containing <1 $-CH_2Cl$ group per 15 aromatic nuclei and reacting the product with (*a*) a primary or secondary amine to produce a weakly basic anion-exchange resin or with (*b*) a tertiary amine to produce a strongly basic anion-exchange resin.

U.S.P. 2,597,491–4 (12.5.51; 20.5.52). J. C. H. Hwa, assr to Rohm and Haas Co. Ion exchange resins: (*a*) containing 70 to 98% methyl vinyl ketone *A* produced by polymerizing at 50° to 80° C in absence of oxygen a mixture of *A* and a polyolefin with only acyclic olefin linkages, converting $<15\%$ of the CO groups to formamido groups, which are then hydrolysed to amino groups; (*b*) a sulphonated polymer containing $<70\%$ of polymerised vinyl anisole; (*c*) reaction product of a primary or secondary amine and a polymer containing $<70\%$ polymerized vinyl anisole having <1 nuclear substituted C_{1-4} haloalkyl group per 15 nuclei, which in (*d*) is converted into an alkylamino group.

U.S.P. 2,595,831 (Neth. 18.9.47; 6.5.52). W. L. J. de Nie and R. H. M. Meijer, assrs to Shell Development Co. Disintegrating liquid containing conglomerates *A* of polyvinylidene chloride particles by introducing *A* into a rotating drum having a slightly inclined shaft and radial vanes attached to the inner wall and passing air at 80° C over *A* and into a settling chamber, where suspended particles are collected as a fine dry powder.

U.S.P. 2,595,797 (11.6.49; 6.5.52). G. L. Leyonmark and E. Arundale, assrs to Standard Oil Development Co. Production of aq dispersions of high polymers by dispersing a soln of the polymer in water-insoluble, volatile organic solvent b.p. $<100°$ F, in water at 70° to 100° F/>1 atm in presence of 2 to 6% of a surface active agent, and then releasing the pressure to vaporize the solvent.

U.S.P. 2,597,741 (29.11.50; 20.5.52). J. H. Macey, assr to B. F. Goodrich Co. An electrically conductive rubbery composition comprising 100 parts by weight (p.b.w.) vulcanized rubbery conjugated diene polymer, 10 to 125 p.b.w. polyethylene and 40 to 150 p.b.w. of an electrically conductive carbon black.

U.S.P. 2,597,087 (9.4.51; 20.5.52). W. W. Cowgill, assr to United States Rubber Co. Paper coated with a thin transparent coating of a resinous copolymer *A* of 65 to 80 wt % styrene and acrylonitrile or mixtures of 50 to 95 wt % *A* and a rubbery copolymer of butadiene and acrylonitrile.

U.S.P. 2,595,847 (23.9.49; 6.5.52). G. E. Ham, assr to Chemstrand Corpn. Homogeneous mixture of 65 to 95 wt % diethyl phosphite and 5 to 35 wt % of a copolymer of 70 to 90 wt % acrylonitrile and 10 to 30 wt % of another monomer for use in extruding fibres of the polymer.

U.S.P. 2,597,378 (8.5.46; 20.5.52). L. F. Rogers and M. S. Ebert, assrs to Continental Can Co. Inc. Composition capable of exhibiting tackiness on heating during repeated cycles of heating above and cooling below room temp and of adhering strongly to metal and cellulosic surfaces when cooled in contact therewith comprises 40 to 50 parts by wt of paraffin wax, m.p. 80° to 150° F, and 60 to 50 parts by wt of a butyl rubber having a Mooney visc of 30 to 70.

U.S.P. 2,598,644–5 (29.9.48; 27.5.52). P. E. Marling, assr to Monsanto Chemical Co. I. Coating composition comprising a soluble copolymer of 25 to 75 wt % styrene, α-methylstyrene, vinyldiphenyl, or *iso*propenyldiphenyl *A* with 75 to 25 wt % of a natural drying oil *B*, a natural drying oil and a resin obtained by condensing styrene oxide with phenol or a *p*-C_{1-6} alkyl phenol. In II, *B* is an unsaturated natural drying oil acid modified alkyd resin of acid no. 2 to 20.

U.S.P. 2,596,960 (7.4.27; 13.5.52). D. Schoenholz and H. Terry, assrs to Foster D. Snell Inc. A finishing composition giving a bright drying film which is an aq emulsion of polyvinyl resin particles averaging $>0{\cdot}6$ μ, a water insoluble solvent plasticizer for the resin serving as a film coalescing agent, a bright drying polishing wax (carnauba, candelilla, montan, microcrystalline pet wax, or mixtures thereof) in ratio 3 to 30 parts of wax to 100 parts of total materials other than water, a non-cationic water soluble surface active agent which is dispersible in the resin and an infinitely water soluble liquid of b.p. > 100° C soluble in the mixed resin to retard evaporation of water.

U.S.P. 2,596,863 (30.8.49; 13.5.52). H. R. Moulton and J. Mahler, assrs to American Optical Co. Cement for laminating optical elements consisting of rosin, chlorinated paraffin wax, phenyl salicylate, and polyethylene glycol dimethacrylate.

U.S.P. 2,598,496 (21.1.50; 27.5.52). T. F. Bradley and De L. E. Winkler, assrs to Shell Development Co. Vinyl halide resins are stabilized to heat and light by incorporating a divalent metal salt of a hydrocarbon substituted benzoic acid, *e.g.*, cadmium *p-tert*-butyl benzoate.

U.S.P. 2,597,987 (24.3.50; 27.5.52). J. Harding, assr to Union Carbide and Carbon Corpn. Vinyl chloride resin having $n = 1{\cdot}51$ to $1{\cdot}53$ is heat stabilized with a hydrocarbon tin carboxylate and light stabilized with a magnesium salt (phosphate, carbonate, silicate) of $n = 1{\cdot}50$ to $1{\cdot}54$.

U.S.P. 2,598,636 (25.9.50; 27.5.52). J. Dazzi, assr to Monsanto Chemical Co. Vinyl chloride polymer is plasticized with a tetracarboxylate obtained by combining 1 mole of a trialkyl or tris (alkoxyalkyl) aconitate with 1 mole of an alkyl or alkoxyalkyl ester of a non-conjugated, unsaturated, non-hydroxylated C_{10-24} fatty acid, said alkyl or alkoxyalkyl radicals containing 1 to 8 C atoms.

U.S.P. 2,597,920 (29.6.51; 27.5.52). R. T. Carroll, assr to B. F. Goodrich Co. Vinyl and vinylidene chloride polymers are heat and light stabilized by incorporating the reaction product of an organo tin oxide R_1R_2SnO, where R_1 and R_2 represent monovalent hydrocarbon groups, with a hydrocarbon ester of an oxygen-containing acid, preferably an ester of maleic acid, *e.g.*, dioctyl maleate.

U.S.P. 2,595,310 (8.7.50; 6.5.52). M. K. Smith, assr to The Baker Castor Oil Co. PVC plasticized with tricresyl phosphate and stabilized with Ba ricinoleate.

U.S.P. 2,595,619 (Neth. 4.3.48; 6.5.52). H. T. Voorthuis, assr to Shell Development Co. Stabilizing a halogen-containing compound to heat by incorporating a diamide of a carbonic acid and an epoxy compound.

U.S.P. 2,596,140–1 (17.2.50; 13.5.52). H. R. Gamrath and J. K. Craver, assrs to Monsanto Chemical Co. Monalkyl dicresyl or diphenyl phosphate esters in which the alkyl group contains a branched chain of 6 to 18 C atoms and terminates with a CH_3 group, *e.g.*, 2-ethylhexyl, 6-methylheptyl, or trimethylhexyl phosphates. Useful as plasticizers for PVC at low temp, synthetic lubricants, hydraulic fluids, and E.P. additives.

U.S.P. 2,597,963–4 (10.9.47; 27.5.52). L. L. Winter, assr to Union Carbide and Carbon Corpn. Production of a fluid impervious carbon article by producing *in situ* in the pores thereof a carbide of Mo, V, Cr, Ti, Zr, or Ta and then impregnating the

carbided pores with (*a*) a molten metal fluoride, m.p. < 1100° C, (*b*) molten siliceous material m.p. < 1000° C, and solidifying the substance *in situ* by cooling.

U.S.P. 2,596,829 (26.5.49; 13.5.52). R. B. Trusler, assr to Davies-Young Soap Co. Polishing and filling composition consisting essentially of a montanic acid ester of ethylene glycol forming a wax of acid number 20 to 50 and a pet solvent of flash point 50° to 90°, the wax forming *ca* 4 wt % of the composition and 10 to 20 wt % of the wax being in solution, the remaining wax being retained in finely divided suspension in the solvent as a settling filler.

U.S.P. 2,597,557 (25.5.49; 20.5.52). L. E. Amborski, assr to E. I. du Pont de Nemours & Co. Inc. Elongation characteristics of drawn oriented fibres of polyethylene terephthalate are improved by treatment with aq HNO_3 at 0° to 95° C.

U.S.P. 2,597,451 (20.11.48; 20.5.52). J. J. Coleman and D. V. Louzos, assrs to Burgess Battery Co. A primary cell comprising an anode, a Mg or Ca cathode, and an electrolyte comprising an anhydrous solvent (C_{1-5} normal aliphatic alcohol or glycol) containing a dissolved chloride, nitrate, or perchlorate of Mg or of metals electronegative with respect to Mg.

U.S.P. 2,597,452–7 (20.11.48; 20.5.52). J. J. Coleman and D. V. Louzos, assrs to Burgess Battery Co. Primary cell comprising an anode, a Mg cathode, and as electrolyte: (*a*) a nitromethane or nitroethane soln of $MgClO_4$; (*b*) a pyridine soln of $MgCl_2$, $Mg(NO_3)_2$, or $MgClO_4$; (*c*) acetone soln of $MgClO_4$; (*d*) methyl acetate soln of $MgClO_4$; (*e*) methanamide soln of $MgCl_2$.

U.S.P. 2,598,586 (14.3.50; 27.5.52). L. D. Mink, assr to Swift and Co. Shell eggs are preserved by coating with a non-volatile mineral oil and a cyclized rubber resin.

V. P. P.

Coal, Shale, and Peat

667. Use of low grade fuels in gas turbines. J. B. Bucher. *Gas Oil Pwr*, 1952, **47**, 284–6.—Tests with peat and slurry as fuels in gas turbines are described, in which the fuel is dried by waste heat. In one installation peat containing 50% water was dried to 25% water in the hoppers and was then readily burned. With coal slurry the moisture is reduced from 25 to 6%, and it is calculated that a 2000-kW plant could be run on 2200 kg coal/hr, of ash and moisture contents 20 and 25%.

With low grade coals disposal of the ash is important. Either the gases must be filtered at 700° C or the plant must be run on a closed cycle. Closed cycle gas turbines can also be operated economically on waste gases at 800° C and atm pressure from carbonizing retorts. Gas turbines can now operate at efficiencies of up to 30%, and in the future efficiencies of 40%, using low grade fuels, may be obtained. H. C. E.

668. Some fuel and power projects. H. R. Cox. *Gas Oil Pwr*, 1952, **47**, 298–300.—Describes research and development work by the Ministry of Fuel and Power on the use of solid coal as a fuel for gas turbines. Results are reported with the following types of gas turbine: open cycle, internal combustion; open cycle, two-stage internal combustion; open cycle, external combustion; closed cycle. A gas turbine capable of using methane in mine ventilation air (<1% CH_4) is proposed. The essential part of this installation is a regenerative heat exchanger device combined with a combustion chamber. (See also Abs. No. 2946—1952.) H. C. E.

669. Investigations of softening, swelling power and driving in the fat-coal range. A. P. Oele. *Brennst Chemie*, 1952, **33** (13–14), 231–8.—Following a review of solvent action on coal and theories advanced, the softening and swelling mechanism of fat coal is expressed. Conclusions are supported by photomicrographs of pre-heated specimens etched with pyridine. Vitrite, the binder in softening coals, fills the intergranular spaces as foam under occluded-gas pressure. Thermobitumen, the true cement, wets and impregnates the constituents, decomp, and sets later. Other constituents influence this effect. Fusite and durite exert a thinning effect on int and ext surfaces and segregate, causing incohesive coke formation. Vitrite modifies this effect. Plasticizing and cementing by clarite–thermobitumen are surface effects on the deformable, non-swelling grains. Clarite grains sinter together and bind large surfaces firmly. Clarite segregation has less effect than that of fusite or durite. In driving vitrite-rich coals of low volatile cont damage oven walls. Final contraction—

important for lump coke gradation—restricts driving. Contraction theories are discussed. Contraction is considered decisive for driving and lump coal gradation, which occurs in the last period of the softening zone, where the coal decomp vigorously without swelling. This residual plasticity arises from the heterogeneous nature of the swelling and decomp coal substance. According to the measure of vaporization of liq components and temp rise, the quality of the residual coal is changed under the plasticizing influence of the thermobitumen. The vitrite-residual coal becomes plastic and the system temporarily absorbs gases. Solidification of the residual coal phase sets in; relative to the amounts and temp-sensitivity of the unvolatilized thermobitumen phase the bituminous binder then sets sooner or later. This phase difference in setting is expressed in the variable temp of the max vol of swelling and the end of the primary gasification or by complete setting of the substance. R. T.

670. Progress in shale oil processing. Anon. *Petrol. Process.*, 1952, **7**, 1624–7.—Good yields of typical refinery products such as gas, naphtha, and light and heavy gas oils have been retorted from shale, mined at the U.S. Bureau of Mines pilot plant at Colorado.

The feasibility of refining by thermal means shows commercial promise, and operations such as recycle cracking, vis-breaking, and the production of gasoline from shale oil, by TEL blending, have been established.

The operating conditions, together with product yields and properties for the recycle coking, recycle cracking, and viscosity breaking of the crude shale oil, are given in tabular form. Similar tables are presented for the recycle cracking of light and heavy gas oil mixtures, and the thermal reforming of shale oil naphtha. J. W. H.

671. Patents. U.S.P. 2,595,979 (25.1.49; 6.5.52). E. F. Pevere and G. B. Arnold, assrs to Texas Co. Coal *in situ* is liquefied by contacting with a hydrogenating agent (H_2, hydro-aromatic compounds) at 550° to 850° F/>1000 psig.

U.S.P. 2,596,793 (11.5.49; 13.5.52). E. J. Schabelitz. Oil bearing shales not spent by oxidation are extracted by forcing methylene chloride at 35° to 40·5° C/100 to 1500 psi for 1 to 5 hr through the shale.

U.S.P. 2,597,504 (Sweden 3.12.47; 20.5.52). M. Larsson, assr to F. G. Liljenroth. Uranium is extracted from bituminous shale by air blowing a suspension of the shale in alkali carbonate solution and separating extract from solids. V. P. P.

Miscellaneous Products

672. How to lengthen life of solid desiccants. B. F. Koepke and V. M. Stowe. *Oil Gas J.*, 12.1.53, **51** (36), 107.—Effective service life of desiccants used in drying natural gas, L.P.G., and petroleum products may be prolonged by removing contaminants, avoiding mechanical damage to desiccants and by use of suitable reactivation conditions. G. A. C.

673. Patents. U.S.P. 2,595,928 (7.3.51; 6.5.52). C. C. Currie and M. C. Hommel, assrs to Dow Corning Corpn. Antifoam emulsion composed of 3 to 12 wt % glyceryl monostearate, 3 to 24 wt % of polyoxyethylene stearate or propylene glycol monolaurate, 2 to 40 wt % of a benzene soluble methyl polysiloxane of <200 cps visc at 25° C containing 2 to 10 wt % of silica aerogel or fume silica and 24 to 95 wt % of water.

U.S.P. 2,596,925 (31.12.48; 13.5.52). L. O. Gunderson, assr to Dearborn Chemical Co. Foaming in boilers is inhibited by adding a compound of the formula

$C_{17}H_{35}.SO_2.NH.CH_2.CH_2.N(COCH_3).CH_2.CH_2.N(COC_5H_{11}).CH_2.CH_2.NH.SO_2.C_{17}H_{35}$

U.S.P. 2,596,279 (30.12.50; 13.5.52). J. Nichols and V. S. de Marchi, assrs to Interchemical Corpn. Condensing 2 to 3 mol equiv of an allylic alcohol with 1 mol equiv of a conjugated diene by heating the mixture at 250° to 300° C/600 to 1500 psi and separating unreacted compounds and diene polymers from the product.

U.S.P. 2,597,202 (4.9.48; 20.5.52). P. O. Tawney, assr to United States Rubber Co. Soluble, unsaturated interpolymer of a dialkyl fumarate, vinylidene chloride, and a 2-alkenyl chloride (allyl chloride, methallyl chloride), which is converted to an insoluble, heat resistant resin by further polymerization.

U.S.P. 2,596,650 (28.12.49; 13.5.52). J. R. Caldwell, assr to Eastman Kodak Co. Copolymers of acrylonitrile and *N*-allyl and *N*-2-methallyl acylamides.

U.S.P. 2,596,945 (24.3.47; 13.5.52). E. C. Shokal and C. W. Schroeder, assrs to Shell Development Co. Copolymerizing a mixture of methacrylonitrile *A* and diallyl phthalate *B*, in which *B* forms 5 to 45 wt % of *A*.

U.S.P. 2,596,737 (13.10.50; 13.5.52). R. W. H. Tess, R. H. Jakob, and T. F. Bradley, assrs to Shell Development Co. An interpolymer of a monoaryl-2-alkene-1 having up to 4 carbon atoms in the alkene group, and an olefinically unsaturated fatty acid polyester of a glyceryl polyether of a dihydric phenol, said acid having 12 to 22 carbon atoms and an iodine value of 110 to 400, the polyester containing <3 acyloxy groups of the fatty acid joined to the glyceryl radicals, and the interpolymer containing 10 to 75 wt % of monoarylalkene. V. P. P.

Corrosion

674. Cathodic protection against corrosion. G. C. Porich. *Petrol. Times*, 23.1.53, **57**, 69.—An outline is given of the history of cathodic protection from Galvini to present times. G. A. C.

675. The use of paints as protectives in the fight against corrosion. A. D. C. Hamilton. *Petrol. Times*, 23.1.53, **57**, 65.—A survey is given of the effectiveness of paints with surface pretreatment, surface priming, undercoats and finishes, maintenance, and protection of ships. G. A. C.

676. Soil resistivity measurements for corrosion control. F. O. Waters. *Corrosion*, 1952, **8** (12), 407–9.—The electrical resistivity of soils is a rough indication of their corrosivity to buried steel pipelines, except when acid soils are encountered. For corrosion surveys, therefore, resistivity measurements are often adequate, using simple instruments such as Shepard canes. The relative merits of the available instruments are discussed. K. G. B.

677. Galvanic corrosion—2. Anon. *Oil Gas J.*, 12.1.53, **51** (36), 121.—The galvanic cell at a point in a pipeline is studied and corrosion due to dissimilar metals illustrated. G. A. C.

678. Protective coatings. K. Tator. *Chem. Engng*, Dec. 1952, **59**, 144–90.—The prevention of corrosion of chemical plant and structural steelwork by organic paint films, mastics, and linings is reviewed.

The expense of applying linings thicker than 0·02 inch is only justified for equipment in direct continuous contact with the product, when corrosion of the bare metal would exceed 0·05 inch p.a.

Protection from contact with vapours and splashes can be given by films down to 0·005 inch, but experience shows that below this thickness the maintenance exceeds the advantage in initial costs. 40% of all finishes form films below 0·005 inch, and the economic optimum is to apply the desired thickness in three coats.

The properties of available coatings are detailed in three classes: elastomers—natural rubber, GR-S, and neoprene; thermosetting—phenolics, furanes, epoxy resins, and paints; thermoplastic—vinyls, vinylidene chlorides, polyethylene, oils and waxes, chlorinated rubber, styrene–butadiene, and bitumens.

Scale is best removed by sandblasting where safety regulations permit, and sources of weakness due to sharp corners and projections should be removed first. Proprietary coatings, metals, ceramics, rubbers, plastics, and other materials on the U.S. market are tabulated. D. H.

679. Dow conquers sea water corrosion. J. P. Thornton, Ed. *Petrol. Process.*, 1952, **7**, 1640–3.—Owing to the corrosive nature of seawater, it is not generally used as a process cooling medium. Dow Chem. Co. at Freeport, U.S., however, use treated seawater as a coolant and process raw material, with pumpage in the order of several hundred thousand g.p.m. The methods used in treating the seawater (from the Gulf of Mexico) and preventing corrosion are given in this article.

The salinity of the seawater used is quite high, and contains many minute organisms too small to filter out. Primary and secondary screening of the water is employed to remove large debris. After pumping to an elevation of 12 ft above sea-level, 1 to 2 lb of chlorine per million lb of seawater are added to inhibit growth of marine organisms.

The limiting velocity of the seawater in various types of condenser tubing has been found to be in the region of 5 to 10 f.p.s. for Admiralty brass and high Fe Cupro Nickel. Mild steel will resist attack reasonably well when velocities are low; when high, near 10 f.p.s., the corrosion rate will increase from 0·005 inch per year, for still water, to 0·03 inch per year.

Cathodic protection is used extensively by Dow Co., who use magnesium in varying forms as strips, blocks, or rods. Large dia pipes are protected by attaching anodes, in cylindrical form, internally at frequent intervals along the pipe. J. W. H.

680. How corrosion was licked on Las Mercedes pipeline. E. G. Molnar. *Oil Gas J.*, 22.12.52, **51** (33), 236.—This 16-inch line built in 1948 runs 157 miles from central part of Venezuela to the Caribbean Sea, transporting crude oil.

From 1950 corrosion became serious, and was mitigated by raising eastern part on concrete blocks and installing magnesium anodes at most important road and river crossings.

Survey results, pipeline data, and corrosion history are given. G. A. C.

681. How Bahrein Petroleum combats sea water corrosion at Persian Gulf installations. R. L. Davis and R. F. Heinzerling. *Oil Gas J.*, 22.12.52, **51** (33), 264.—Corrosion and pitting of mild steel exposed to seawater spray at high atmospheric humidity and temperatures found in the Persian Gulf occurs at a very high rate.

Some sections of lines are being raised, and breakwaters being built to minimize spray, with a result that corrosion is reduced to a rate where protection by paint or cutback asphalt is practicable. G. A. C.

682. Corrosion problems in oil tankers. Anon. *Petrol. Times*, 23.1.53, **57**, 73.—Methods are outlined for protection of internal surfaces of cargo spaces. Methods include use of organic coatings, cathodic protection, corrosion inhibitors, dehumidification, and cargo heating coils. G. A. C.

683. Corrosion control in oil refineries. Anon. *Petrol. Times*, 23.1.53, **57**, 75.—Means of protection in process plants are reviewed where corrosion occurs within refinery vessels as a result of the refining processes. Causes of the corrosion are analysed. G. A. C.

684. Pipe lines. B. Waeser. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (9), 241–2; **3** (11), 289–91.—Pt I deals with production, chem composition, causes of corrosion, protective measures, and refs to relevant literature. Pt II refers to international literature on special work on rust prevention based on bitumen or plastics. Some relevant DRPs are discussed. R. T.

Engines and Automotive Equipment

685. Fuel injection systems for large marine engines. P. Jackson. *Gas Oil Pwr*, 1952, **47**, 277–80.—The Doxford common-rail system of fuel injection suffers from the disadvantage that, should a pilot ram stick, that cyl would receive excess fuel. A jerk-pump for each cyl would involve the redesign of camshaft and driving gear, and the pipes from pumps at one end of a six-cyl engine would be so long (up to 60 ft) that the injection characteristics would be impaired.

After considering various types of existing units, a special compression-operated pump was designed for the Doxford engine. This pump incorporates its own fuel-metering device, and is arranged for use with the two standard automatic spring-loaded injectors in each cyl. In the original design there was considerable overheating, and in a test pump operated pneumatically at 500 psi there was considerable air leakage past the piston.

A pump operated by oil pressure at 5500 psi was then designed and installed. It was found that the fuel injection pressure was almost constant throughout the injection

period and the rate was independent of engine speed; the pump operated very smoothly.

The Doxford engine gives almost the same fuel consumption and combustion characteristics throughout the load and speed range with all three types of injection described above, despite the different fuel-injection-pressure diagrams obtained. Experiments were also made with a C.A.V. Bosch fuel pump and injector in conjunction with pneumatic injection at an air pressure of 4000 psi. Fuel consumption with this arrangement was greater, due presumably to the low injection pressure of 2000 psi.

H. C. E.

686. Use of heavy fuels for medium sized marine and stationary diesel engines. J. R. P. Smith. *Gas Oil Pwr*, 1952, **47**, 295–7, 300.—Tests with the five fuels: (*a*) gas oil, (*b*) distillate marine diesel fuel, (*c*) blended marine diesel fuel, (*d*) light boiler fuel, (*e*) medium marine (heavy) fuel show that performance (based on thermal efficiency) is unimportant for all except (*c*), and classification of fuels should be determined by their effect on the engine in respect of the following:—

Cyl bore wear. The engine test procedure is described, and the fuels are centrifuged when necessary. They are compared with regard to wear, % ash, and % S; (*a*) and (*b*) give the least wear and (*d*) the most; (*d*) also contained by far the greatest ash. (*e*) contained 3% S, (*d*) 2%, and the remainder *ca* 1%.

Carbon deposits. Injection design and position are important here. In 200-hr tests it was found that (*a*) and (*b*) gave little deposit, (*c*) gave more, and with (*d*) and (*e*) deposits up to $\frac{1}{8}$ inch thick were obtained.

Crankcase chamber deposits are measured by the rate of deterioration of the lub oil, and on the basis of acidities (*b*) was more than twice as good as (*e*).

Exhaust smoke colour was the same for all fuels. At a given load exhaust temps were 5° to 10° F higher with (*d*) and (*e*) than with the remainder.

Startability was good with all fuels if the engine was warm, but with (*d*) an ambient temp of 45° F was necessary. Cold starting with (*e*) was not tried.

The paper closes with an estimate of the maintenance costs and replacements required for the engine in a particular ship when running on the types of fuel (*a*) to (*e*), allowance having been made for the different calorific values of the fuels. H. C. E.

687. Injection characteristics and diesel knock. A. J. Davies. *Gas Oil Pwr*, 1952, **47**, 303–6.—The origin of diesel knock is discussed, means of controlling it are described, and the effect of modifications of the cyl-pressure diagram on engine vibration is worked out in terms of an ideal system.

Max rate of pressure increase is not a reliable indication of the onset of diesel knock. If the C.N. of the fuel is increased from 20 to 45 there is a marked reduction, but increase of C.N. above 45 effects little improvement. Pilot injection of 30 C.N. fuel from 35 to 25° before t.d.c. gave a diesel knock rating equivalent to 50 C.N. fuel both in a single-cyl and in a six-cyl engine, but in the latter experimental difficulties limited the speed to 950 to 1450 r.p.m. and the b.m.e.p. to 70 to 99 p.s.i. Knock was measured aurally and by automatic recording of cyl-head vibration.

In experiments with the quantity and timing of the pilot charge there was no evidence of any critical amount, although if too large its own ignition will produce knock. Admitted at 53° before t.d.c. the pilot charge is ineffective; optimum timing appears to be between 35° and 27° before t.d.c.

Study of an idealized system leads to the conclusion that that modification of the cyl-pressure diagram mainly responsible for the suppression of diesel knock appears to be not so much the marked change at the commencement of combustion as the less obvious reduction of maximum rate of pressure rise during combustion. H. C. E.

688. Role of corrosion in engine wear. J. C. Geniesse and H. R. Jackson. *Petrol. Process.*, 1952, **7**, 1620–2. (*Presented at symposium on engine wear by Metr. Sect., Soc. Auto Engrs, N.Y.*, 16 *Oct.* 1952.)—The work of various investigators is reviewed to show the influence of low temp operation conditions and sulphur content of fuels on the wear of cylinder walls and piston rings. Jacket temps, oil, cylinder wall metallurgy, and fuels are important variables in the corrosive wear of engines, and the resulting high oil consumption.

At temps below the dew point of the exhaust gases, *i.e.*, 150° F, water vapour will condense on the cylinder walls, causing rusting, this in effect increases engine wear

very markedly. Mixture ratio is another important variable, leaner mixtures give higher rates of wear, owing to the higher acid content in the exhaust gas.

Engine wear from the above causes can be reduced through proper selection of oil—one with good rust protective properties is necessary—and control of jacket temperature. J. W. H.

689. Explosions in enclosed crankcases of reciprocating engines: their cause, effect, and possible remedy. J. Lamb. *Gas Oil Pwr*, 1952, **47**, 273–6.—Crankcase explosions occur when an explosive mixture is brought in contact with a means of ignition. The crankcase of a working engine is filled with oil droplets, and if the air were replaced by an inert gas (say exhaust gases) explosions could not occur. This is not thought to be a feasible solution to the problem.

To prevent explosions when a bearing runs hot, the engine should be stopped and oil circulated until the bearing is cool. Oil circulation must be stopped before the crankcase door is opened, and naked lights should not be used for inspection. Explosions sometimes occur when a stopped engine is restarted or when a crankcase door is opened; the cause is thought to be general movement of the crankcase gases to bring an inflammable mixture near a hot bearing. All efforts should be directed to ensuring that bearings and pistons do not become overheated, and various devices for the detection of overheating are described.

Crankcase vents are too small to cope with pressure rises in an incipient explosion. Ventilation by an air current may reduce the violence of an explosion, but the design of a crankcase is such that complete ventilation of every part is impossible. Crankcases hermetically sealed still contain appreciable amounts of air, even after weeks of running; and, furthermore, with marine engines it is advantageous to provide small doors for inspection purposes. Explosion relief valves must provide adequate escape for the expanding gases and close immediately to prevent ingress of air; two such devices are described.

Experiments were made on the quenching of explosive flames. It was found that five layers of wire gauze of stated dimensions would extinguish a flame 15 ft long and reduce the temp from 1647° to 108° C. The effect on pressure was also determined. Tests are now being carried out on a 1005-h.p. eight-cyl trunk piston marine engine to obtain information on pressure waves when oil mist of varying density is ignited at different points. H. C. E.

690. Recent experiments in the lubrication of oil engines. L. J. Izard. *Gas Oil Pwr*, 1952, **47**, 271–2, 276.—Discusses the deterioration of lub oils when used in C.I. engines, and deposition on engine parts, with particular reference to additive type lubricants.

Corrosion and abrasion cause cyl wear. Corrosion is due to the formation of sulphuric acid, and occurs in the area of upper ring travel; it can be largely prevented by keeping the cyl wall temp well above the dew point of the acid at all pressures. Abrasion is due either to failure of the oil film or to the presence of hard particles in the oil, and is most marked at the end of the stroke. Wear can be reduced by using Cr-plated piston rings or detergent oils. Oils containing anti-wear additives actually appear to promote wear in a new engine until the surfaces are smooth. Cyl wear is most serious in low-speed two-stroke engines, but can be alleviated by using detergent oils and by better distribution of lub oil.

Ring sticking, due to the accumulation of products of incomplete combustion and oil deterioration, occurs if the ring groove temp exceeds 390° to 410° F, and is a trouble in high- and medium-speed engines. As regards ring sticking M.V.I. straight oils are superior to H.V.I. straight oils, but with detergent the V.I. effect disappears.

Port blocking is due to the build-up of soot, etc., mixed with lub oil on the hot ports of two-stroke engines; exhaust ports are less subject to blocking than scavenge ports. Detergent oils may effect an improvement, which is probably indirect, due to improvement in piston and ring condition.

Lacquer formation depends on factors such as type of engine, fuel, and running conditions, and can be overcome by using a detergent oil. Such oils are less effective in two-stroke than in four-stroke engines.

Valve deposits occur mainly on exhaust valves, but also to some extent on inlet valves, and, once established, increase rapidly due to the onset of gas blowing and consequent high temps. Under efficient operating conditions detergent oils and straight

oils behave similarly, but if excessive amounts of lubricant reach the cyl, detergent oils cause larger valve deposits.

Crankcase sludges are due to contamination of the oil by combustion chamber products, and detergent oils hold these insoluble matters in suspension. Abnormal sludging may be caused by overloading, continuous light-load running, ring-sticking, water leakage, etc. Crankcase corrosion and bearing corrosion may be alleviated by detergent oils. H. C. E.

691. Gauge for indicating pressure transients in a combustion chamber. H. D. Warshaw. *Rev. sci. Instrum.*, 1952, **23**, 493–6.—The pressure-sensitive element is a 0·04-inch thick circular plate supported by a threaded body, the whole being made of high tensile steel. A rim projecting beyond the plate surface forms a gas seal when the device is seated in a socket machined in the combustion chamber. A resistance strain gauge is cemented to the inner surface of the plate, so that pressure changes can be converted into voltage changes, which are then amplified and fed to a cathode-ray oscilloscope.

Calibration by static hydraulic pressure shows that the plate deflection is prop to the pressure over the range 0 to 16,000 psi. At the higher pressure the deflection is *ca* 10% of the plate thickness. Tests show that the instruments is linearly responsive to pressure changes of 400 psi per microsec. The effect of temp, and changes in the elasticity of the plate are discussed. H. C. E.

692. Lubrication problems in design of heavy duty engines. W. I. Blessing. *Gas Oil Pwr*, 1952, **47**, 301.—Oil specifications for various types of heavy duty diesel and gas engines are described. Suggested bearing clearances and associated oil pressures are given. For cooling as well as lubrication, oil should be circulated at 0·17 to 0·23 g.p.m/h.p. for normally aspirated engines; for supercharged units the figure should be 0·12 to 0·17. 5 to 8% of the total heat input is transferred to the oil when the pistons are oil-cooled. Recommendations for keeping the oil in good condition are given, and various types of filters are described. H. C. E.

693. Maintenance of internal combustion engines. P. H. Moore. *Petrol. Engr*, Nov. 1952, **24** (12), C21–5.—The advantage of full flow filtration compared with by-pass filtration of lubricating oil in reducing wear on moving parts is shown graphically for a four-cyl, side-valve gasoline engine. E. K. J.

694. An investigation into the importance of chemiluminscent radiation in an internal combustion engine. H. D. Baker and G. L. Laserson. *General Discussion on Heat Transfer, Inst. Mech. Engrs, Sect. IV*, 334–9, Sept. 1952.—The distinction between chemiluminescent and thermal radiation is explained. Theoretical arguments are given, and previous experimental evidence is cited, showing that chemiluminescent radiation may play an important role in the heat transfer processes in an i.c. engine and other flames and explosions. A procedure is described for determining the relative magnitudes of thermal and chemiluminescent components of the total radiation. Data thus obtained are given, indicating that the chemiluminescent component is only a small fraction of the heat transferred. (Authors' Abstract.) W. H. C.

695. Heat transmission in internal-combustion engines. C. F. Taylor. *General Discussion on Heat Transfer, Inst. Mech. Engrs, Sect. V*, 397–401, Sept. 1952.—The analogy between certain aspects of heat transmission in i.c. engines and heat transmission by forced convection between fluids and solid surfaces is reviewed, and from the data recorded some of the limitations of this analogy are discussed. It is hoped that the information given will indicate how a limited number of data, properly correlated, can be used to give useful information on heat flow and temperatures in machines of great complexity, such as the i.c. engine; and also stimulate further experiment designed to yield basic data for heat transfer processes in two-stroke cylinders and for critical points in four-stroke cylinders not covered by this discussion. W. H. C.

696. Heat transfer in internal combustion engines. J. F. Alcock. *General Discussion on Heat Transfer, Inst. Mech. Engrs, Sect. V*, 438–40, Sept. 1952.—Heat problems are discussed, and graphs are given showing the relation of heat loss to fuel rate for twelve

diesel engines, and the distribution of heat flow along cylinder bore. The main hot spots and their cause are described and discussed. Heat flow is discussed with respect to: exhaust valves; fuel injectors; water cooling; piston cooling. Data are given and discussed with reference to the disposal of heat and the intensity of local heat flow. W. H. C.

697. Two gas combustion turbines of the open cycle system for generating purposes. H. T. van Houten. *Ingenieur, 's Grav.*, 1952, **64** (50), A554–5.—A general description is given of two gas combustion turbines on test at the Royal Dutch–Shell Refinery at Pernis, near Rotterdam. The first one is a 1750-kW turbo-generator unit, made by Metropolitan-Vickers. The second one is built by Gasturbine Maatschappij, The Hague, and rated at 2000 kW. A brief comparison between the two sets is made and a set-up diagram given. Both units are intended for the Venezuelan oilfields.
G. F. T. C.

Safety Precautions

698. "Pre-fabs" permit good savings in structural fireproofing. C. J. Kuhasz. *Petrol. Process.*, 1952, **7**, 1616–19. (*Based on "Improved methods for Fire-proofing Structures" presented at 7th Ann. Petrol. Mech. Eng. Conf., ASME*, 1952.)—By the use of shop-fabricated sections of light-weight concrete, the installation cost of fire-proofing structures in refineries has been cut 25 to 50% under that of conventional fire-proofing methods. The cast sections are made in adjustable metal pans from a mixture of processed perlite aggregate, weighing 8 to 12 lb/cu. ft., and type Ia air-entrained Portland cement, at a ratio 4 or 5 to one. Water is added until the density of the lightweight mixture is between 50 and 60 lb/cu. ft. when cured. The weight is 65% less than that of ordinary heavyweight concrete.

The sections, which are limited to two shapes, 90° ells and flats, which are 2 inches thick in variable widths, and 36 inches long, are secured to the structural profiles to be protected by using threaded welding studs of single length. Workability of the perlite concrete puts it in the same category as wood; it can be drilled, sawn, and any rough spots can be dressed down. ASTM fire tests have been satisfactorily performed on the light-weight prefabricated concrete. J. W. H.

699. Results of co-operative safety efforts. H. Hillman. *Petrol. Engr*, June 1952, B42–8.—Sponsored in 1945 by the Amer. Assoc. of Oilwell Drilling Contractors, the safety programme has expanded almost industry-wide and now incorporates many features not originally contemplated. Through the demands of drilling contractors and with the help of such organizations as the National Safety Council and the U.S. Bureau of Mines, the AAODC has now made available thirteen important services.

The tangible benefit received from a successful safety programme is a reduction of workmen's compensation costs and other rates. This reduction is shown in a number of examples taken from California and elsewhere. G. S. S.

700. Electrical installations. B. Z. Segall. *Oil Gas J.*, 15.12.52, **51** (31), 143; 22.12.52, **51** (33), 351; 29.12.52, **51** (34), 99.—No. 149 in the Refiner's Notebook series gives Pt 9 of the subject and deals with method of lubrication of threaded joints. Installation of breathers and drains on conduit lines is illustrated.

No. 150 gives Pt 10 of the subject, and deals with fused equipment and lists limitation of fuses.

No. 151 deals with lighting fixtures, and arcing, sparking, and high temp devices. G. A. C.

701. Protection of buildings and installations in petroleum industry against lightning discharge. S. Dziurzynski. *Nafta* (*Krakow*), 1952, **8**, 13–19.—Statistical data on frequency of cloud–earth discharges is followed by theory of lightning formation and power dissipation. In the light of new observations new safety requirements are put forward. Detailed instructions for installation of lightning conductors on various buildings encountered in petroleum industry are given. Suggestion about earthing all pipes and machinery indoors is made in the interest of safety. M. S.

MISCELLANEOUS

702. What's ahead for petroleum? Pt I. 1967—How much oil will we have? J. E. Swearingen. *Petrol. Process.*, 1952, **7**, 1606–11.—This paper is primarily concerned with the availability of oil from domestic production for U.S. refineries. At present, reserves of oil and natural gas liquids in the U.S. stand at about 32 billion brl, as compared with some 74 billion brl for the rest of the world. The U.S. is importing a little more than 900,000 b.d. of crude oil and refined products this year, and a gradual increase in imports to about 1,420,000 b.d. is expected in 1967. The internal production of crude oil in the U.S. for 1967 is estimated by this forecast at about 8 million b.d., which together with 1·1 million b.d. of natural gas liquids gives an increase of about 2·2 million b.d. over present levels, or about 33%.

The U.S. nation's productive capacity has appreciably exceeded actual production, except during the years immediately following the second world war; and at present the U.S. has a reserve capacity of about 900 thousand b.d. This forecast expects this figure to increase to about 1·9 million b.d. in 1967, or about 21% of the daily production rate at that time.

Pt II. 1967—How much oil will we need? J. W. Boatwright. *Petrol. Process.*, 1952, **7**, 1612–15.—The total domestic demand for petroleum products is forecast to increase from 7,000 to 10,000 b.d. by 1967, or a 46% gain; but a decrease in exports, as a result of increased refinery capacity outside the U.S., should influence the total demand for all products, to increase from 7,500 to 10,000 b.d., or a total increase of 39%. The estimated expenditure by refineries alone in 1952 will probably exceed $1 billion, and it is expected that the industry will be able to meet the market needs in the future by providing adequate refining capacity.

Economic considerations, such as Monetary Stability, Price Freedom, Industry Know-how, and Labour Relations, are discussed. J. W. H.

703. Simple way to draw nomographs. M. Rhoden. *Chem. Engng*, 1952, **59** (11), 146–7.—A quick method of constructing nomographs is presented for equations of direct proportionality between any number of variables raised to different powers. Two numerical examples are given. D. H.

704. Aden court judgment on the "Rose Mary" cargo of Persian oil. J. E. S. Fawcett. *Petrol. Times*, 23.1.53, **57** (1447), 47.—A brief outline is given of all the material facts which came before the court on 1 Jan. 1953. Factors which might influence the course of future litigation on the lines of the *Rose Mary* are also discussed. G. A. C.

705. Changes in patent laws and what they mean. P. J. Gaylor. *Petrol. Process.*, 1952, **7**, 1623.—The Patent Codification Act that came into effect on 1 Jan. 1953 in the U.S. is discussed. Seeing that the U.S. petroleum industry obtains about 130 patents per week, representing 5% of all patents issued, most of the minor changes to the existing patent laws assume relative importance to the U.S. refiners.

J. W. H.

BOOK REVIEWS

American Pipe Lines. George S. Wolbert, Jr. Norman, Oklahoma, U.S.A.; University of Oklahoma Press, 1952. Pp. 179. $3.50.

Although crude oil pipelines—and some products lines—in the U.S. have long been "common carriers" and subject to a special régime under the Interstate Commerce Commission, they still present, in the context of the continuous changes and shifts of American society, many unresolved problems. This is a work devoted to the legal aspects of ownership and use of oil pipelines in the U.S., and particularly to the special questions which arise from their integration, through ownership, into the complex of other oil operations. After briefly examining the historical development of pipeline transport the author surveys the grounds upon which separate ownership of pipelines and their divorcement from the "majors" is advocated, and then proceeds to deal with the various complicated and tortuous inquiries and proceedings with U.S. government bodies and before the Courts which the whole subject has provoked. The debate goes on, and further measures of regulation may lie ahead. The author defends integrated ownership, and as a professor of law he advances his own views on some of the related questions, which are made the more valuable by ample footnotes and citation of sources.

The contents of the book have already appeared serially in 1951 in Vol. 4 of the *Oklahoma Law Review*. P. M. de V.

Common Carrier Pipe Line Operations and Accounting. Edited by Paul J. Graber, C.P.A. Tulsa, Oklahoma, U.S.A.: Ross-Martin Company, 1951. Pp. 194 + xxvi. $7.50.

This is a comprehensive and simply written symposium for the non-technical reader comprising the story of the development and operation of common carrier oil pipelines in the U.S.A., given as a background for the primary purpose of the work, which is to describe the accounting and recording methods which are necessary to comply with the requirements of the Interstate Commerce Commission, and of the Federal and state governments. (Natural gas pipelines are not dealt with, since they are subject to the separate regulatory régime of the Federal Power Commission under the provision of the Natural Gas Act.)

Eleven authorities in the field of pipeline operation and finance contribute separate chapters, the scope of which has been planned by a committee composed of representatives of the pipeline industry and members of the faculty of the University of Tulsa; and other help has been received from other sources. The Editor is Mr. Paul J. Graber, Head of the Department of Accounting, University of Tulsa.

The Appendix provides the set of pipeline records and accounts which are prescribed by the Interstate Commission, and a generous provision of charts, records, and photographs helps to show the very high state of development which oil pipeline transportation has reached in the U.S.A. As pipeline transport extends in other countries we may expect that, as in other departments of the industry, U.S. pipeline technique and operational and control methods will be adopted. The present work is therefore likely to offer considerable help and guidance to operators beyond the U.S.A., notwithstanding the fact that the book is directed to meet U.S. official prescriptions, which do not apply elsewhere. P. M. de V.

Glycols. George O. Curme, Jr., Editor, and Franklin Johnston, Associate Editor. American Chemical Society Monograph Series No. 114. Rheinhold Publishing Corporation, New York, 1952, pp. 389 + xxi. 96*s*.

This monograph has been prepared by members of the Carbide and Carbon Chemicals Co., twelve of whom have contributed with the Editors to the sixteen chapters. Chapters 2, 3, and 4 deal with the "Production," "Physical Properties," and "Commercial Applications" of ethylene glycol, and Chapter 5 deals with "Ethylene Oxide." The derivatives of ethylene glycol and the condensation polymers are

covered in Chapters 6 and 7. Propylene glycol is similarly treated, Chapters 8, 9, and 10 dealing with the "Production," "Properties," and "Commercial Applications," Chapter 11 with "Propylene Oxide," and Chapters 12 and 13 with "Derivatives" and "Condensation Polymers." Higher glycols are described in Chapter 14, and the "Physiological Aspects" of all the various products are discussed in Chapter 15. Finally, Chapter 16 deals with methods of analysis and testing.

The commercial development of manufacturing processes is described for each of the more important compounds, together with a complete survey of the technical and patent literature. Unfortunately, details of the commercial plants have not been published, and the only processes illustrated in the text are the German plants at Ludwigshafen and Gendorf, the details of which have been taken from the BIOS reports. A variety of patents are quoted dealing with the direct oxidation of ethylene, the type of catalyst, and reaction variables. Unfortunately no technical details of the three Carbide and Carbon Chemical Co. plants operating this process are given. The American plants operating the chlorhydrin process are mentioned, but again without technical data.

The chapters on physical properties and commercial applications of the glycols and their associated compounds are excellent, and constitute the major part of the book. They will be of the greatest value to anyone interested in the application of the glycols and in the development of new uses for these compounds. In addition to the usual physical, thermal, and electrical properties, data are given on the P.V.T. relationships, solvent, humectant, and physiological properties. Each chapter is provided with an extensive bibliography, and the text is well indexed and illustrated. F. M.

Proceedings of the United Nations Scientific Conference on the Conservation and Utilization of Resources. Vol. III. Fuel and Energy Resources. London: H.M. Stationery Office, October 1952: 22*s*. 6*d*.; pp. 333.

This volume contains some sixty papers presented at the Conference at Lake Success in 1949 on the following subjects; Techniques of Oil and Gas Discovery and Production; New Techniques for Increasing Production of Oil and Gas; Oil Chemistry; Coal Mining; Coal Preparation; Underground Gasification of Coal; Coal Carbonization; Conservation in Utilization of Fuel for Space Heating; the Integrated Power System; and New Developments in Production and Utilization of Energy. Summaries of the discussions on each of these subjects are also included.

The papers concerned with petroleum and natural gas occupy about a third of the volume. The geological and geophysical techniques of oil and gas discovery are sketched, and the view is expressed that no entirely new tools of discovery are in prospect, though there will undoubtedly be improvements and extensions of the methods at present in use. Developments in drilling are outlined, and it is evident that still greater advances in this field have a large contribution to make to future exploration. Not less important than the discovery of new reservoirs is the conservation of old ones, and attention is given to methods of oil recovery and the substantial progress in technique which has been made in recent years. Reference is made to the part which the production of oil from shale and the use of synthesis processes may play in maintaining the oil supplies of the future, and the importance of modern developments in refining is discussed.

Another third of the book is occupied by papers on coal. Developments in mining operations are reviewed, and the high production rates in the U.S. are shown to be due to advanced mechanization, a good transportation system, excellent organization, and favourable mining conditions, and to the fact that attention is directed to production costs rather than conservation. The discussion of the subject of underground gasification attracted a good deal of interest at the Conference, though it is clear that much more experimental work will be required before the great potentialities of the process can be realized. Coal preparation and carbonization are also dealt with, an item of special interest being the conservation of the high-quality coals required for the production of metallurgical coke.

The final third of the book is concerned with utilization. Domestic heating accounts for a large part of all national fuel consumptions—about 30 per cent in the United Kingdom, and more in some other countries—and the importance of the subject fully justifies the separate treatment accorded to it in this volume. A

growing appreciation of the value of insulation and other factors influencing the efficiency of the various heating systems is leading to a gradual improvement in thermal efficiency, but this is accompanied by a growing demand for increased comfort as living standards rise, and the scope for saving fuel by increased efficiency in domestic consumption is perhaps not so great as is sometimes thought.

The functioning of the integrated power system in several countries is described. The advantages of the system, particularly in enabling the transfer of power from areas, and during periods, of low consumption, lead to high efficiency and low costs, and the extension of the system to more and larger regions may be expected in the future. The discussion of its potentialities and limitations is therefore timely.

The last and largest section of the book deals with modern trends in the use of fuels, and with the developments which are likely to have the greatest influence in the near future, in which the industrial application of nuclear energy cannot be expected. One item of particular importance is the gas turbine. While its place in aviation, both civil and military, is assured, the extent of its application in industry is as yet uncertain and dependent on the outcome of the great volume of research and development work now in progress. The possible use of wind-power receives consideration, and it seems probable that it will eventually find its place as an auxiliary power supply in areas where other sources are not readily available.

The field covered by the papers in this volume is clearly very large, and many of the subjects are necessarily not treated in great detail, but a broad, and on the whole well-balanced, picture is presented of the factors affecting the discovery, winning, and utilization of petroleum and coal, and the production and use of electric power, in relation to the conservation of fuel and energy. C. M. C.

The Science of Petroleum. Volume VI, Part I : The Oilfields of the World. The Eastern Hemisphere. Edited by V. C. Illing. Geoffrey Cumberlege : Oxford University Press, 1953. Pp. 174 + viii. *52s. 6d.*

The Science of Petroleum was first published in four volumes in 1938. In the first volume the editors, in a longish preface, dealt with the scientific and technical advance which the exploration for oil had witnessed since the first world war. They referred to the adoption and development of geophysical surveys, interestingly enough putting gravity before seismic, which, except in a few areas adapted to the refraction method, had not been found applicable. A preface to-day would point out that 85% of all exploration expenditure is incurred in seismic reflection. The editors also pointed out, what if not new was worth emphasizing, that it was not only structures that needed finding but the right sedimentary conditions. It was necessary that the geological history of an entire area must be known. To-day we go farther and say that it is necessary to do more than bring nature into the laboratory or under the microscope ; it is necessary to see contemporary nature as the laboratory, and work backwards. It has mainly been since 1938 that impetus has been given to the new sub-science of sedimentation. It is interesting to recall this preface, for the reason that most of the papers in the present volume take all this new knowledge for granted, as if the authors were unaware how new is its application.

The first volume of the original four, like the present Volume VI, Part I, under review, dealt with the world's oilfields. The present volume brings the first up to date. It is one of four parts, of which Parts I and II are to deal with the Eastern and Western Hemispheres respectively ; Parts III and IV with petroleum geology in its technological aspects. Volume VI, Part I, covering the Eastern Hemisphere, is divided between the different regions in the following ratio : Europe sixty-two pages, Middle East thirty-four pages, Far East and Australasia thirty-four pages, Africa twenty pages, and with six pages of Index. The greater importance of the Eastern Hemisphere in the oil world of to-day, in that it contains more than half the world's reserves, instead of as in 1938 perhaps a quarter, may be judged by the greater space given to it. It gets a separate volume instead of a single section of seventy-one pages (Vol. I, Section IV, pp. 124–95) in a larger book.

The volume is edited by Professor V. C. Illing, who has impressed a knowledgeable group of European geologists to the task. The value of the present volume, in contrast to that of 1938, is therefore not only due to the accretion of knowledge of fourteen years but to the experience which the authors have brought to bear on the areas for which they are responsible. The papers are not mere compilations edited

for the purpose of this compendium, they are original contributions by those having authority of years, even decades, of experience. The value of these papers lies in that they present basic knowledge of the petroleum geology in the countries concerned. They are less concerned with the contemporary scene in so far as it affects oilfield developments; and it is because of this that the delay since the first preparation of the papers in 1947, though subsequently revised, and their publication in 1952 is not a serious matter. Where oil production figures have been included they reached to 1950, and it is to be regretted that they have not been inserted as a record of progress in all chapters. After all, oil is the *raison d'être* and a measure of success of the bulk of this work.

A compilation of this kind is always faced with the dual problem of space for each contribution and of cost. If the original plan had been the issue of a volume of double the size, a work of far greater value would have resulted and the cost need not have been a great deal more. In this sense a comparison may be made between the papers on the Middle East and those of some of the lesser but nevertheless geologically important countries. The four papers on the Midide East occupy the same space as double the number on the Far East. Further, the papers on the Middle East are supplemented by adequate maps, sections, and tables. The section is in great part a magnificent tribute to British scientific work abroad; it includes a chapter on Arabia by the Arabian American Company. One might have asked, however, that Kuwait should have made more of itself.

In terms of space the papers on the Far East and Africa are the least satisfactory. On the other hand, it is encouraging that the coming generation of geologists should be reminded that there are still large areas of the world in which oil geology is little known. Several of these areas await the intensive surveys which modern exploration demands, and it cannot by any means be claimed that the systematic investigation of the sub-continent of India, Burma, China, New Guinea, and Africa, including Egypt, have yet been more than started. The tenuous oil pockets of Africa and Madagascar are still virtually blanks upon the oil map.

It is right that the largest section of the volume should have been devoted to Europe, since the Continent is still the home of classical geology if not of classical oil geology. Indirectly the war contributed much to this section, since it left Europe in a turmoil and brought some of the contributors temporarily under the umbrella of the Government's BIOS organization. Through this it was possible to secure the services of several authors who had made Germany or the Balkan countries their field of work, either during the war years or immediately afterwards. In the light of post-war events it cannot be altogether fortuitous that the countries in which there are outstanding developments to record—the Netherlands, Germany, France, and Italy—are on the right side of the Iron Curtain. Or that such developments as there have been in Austria, for example, have depended upon pre-war surveys by the West for their success. If other countries, such as Roumania, Poland, Hungary, Yugoslavia, or Albania, have lagged behind in modern technical developments it may be that politics and technique do not make good bed-fellows.

A great deal more might be written about this outstanding volume, but it is sufficient to say that no scientific library, let alone an oil library, whether of university, oil company, or other institution, can be complete without it. A. E. G.

ADDITIONS TO THE LIBRARY

British Chemicals and their Manufacturers 1953. Association of British Chemical Manufacturers. London : The Association, 1953. Pp. 179.

Heat Transfer Tables. E. N. Sieder. New York : American Locomotive Co., 1952. Pp. 44. $3.00.

These tables are designed to give the process engineer quick and accurate means of estimating heat transfer surface required in processing plants.

Die Theorie der Destillatim und Extraktion von Flussigkeiten. G. Kortüm und H. Buchnolz-Meisenheimer. Berlin : Springer-Verlag, 1952. Pp. 351 + viii. DM. 39.60.

Die Wärmeabgabe von Strömendem Heiss- und Sattdampf. Georg Winckelsesser. Weinheim : Verlag Chemie GmbH, 1952. Pp. 111. DM. 11.90 net.

This booklet describes results of experimental work carried out under the direction of Professor Kirschbaum on the heating effects of superheated and saturated steam under various conditions. The heating effect of superheated steam is superior to that of saturated steam, and the booklet includes a discussion of the flow of heat within the liquid layer on the cooling surface.

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Oilfield Exploration and Exploitation

Geophysics and Geochemical Prospecting

706. Problems of geophysical interpretation in Alberta. J. A. Legge. *Canad. Min. metall. Bull.*, 1953, **46**, 10–12.—For obtaining data on which to base an interpretation of unproven areas, a careful study is generally made of the characteristics of known producing areas; this practice has proved a sound one in the Alberta Basin. It has been found that, as discoveries become more widespread, the variation in geological conditions have a marked effect on the seismic results, as would be expected. By carrying this analysis over an area, it is possible to anticipate the geophysical picture which should be obtained in connexion with reefing under such varying conditions.

The recent discovery of several reefs of very limited areal extent has shown the necessity of very detailed study of geophysical control. The width of these reefs is such that the anomalies found are limited to only one or two shot points; careful attention has therefore to be given to every anomalous shot point.

Velocity variations provide the geophysicist with some of his most useful criteria for reef determinations. Here they are grouped: (1) near surface velocity variations, including drifts; (2) velocity variations in the Cretaceous sediments; (3) velocity contrasts at the Lower Cretaceous–Palæozoic unconformity; and (4) velocity contrasts

between the reef mass and the enclosing formation. Examples of these velocities are given in the Cretaceous sediments and at the great unconformity with the Palæozoic.
G. S. S.

707. Patent. U.S.P. 2,607,842 (2.3.49; 19.8.52). H. C. Reid, assr to Stanolind Oil and Gas Co. Marine seismic-surveying apparatus adapted for towing by a ship.
J. M. S.

Drilling

708. How to train mud engineers. Pt. I. F. Chisholm and B. Q. Green. *World Oil*, Jan. 1953, **136** (1), 115.—The ever-increasing importance of drilling mud and its high cost have necessitated the training of personnel for this branch of the field work. The instruments used for testing mud in field and laboratory are described. These include the following tests: mud density; viscosity by Marsh funnel, Stormer, and Fann field and laboratory viscometers. A. J. H.

709. Closed steam system cuts boiler maintenance and fuel needs. G. L. Daggs. *World Oil*, Jan. 1953, **136** (1), 132.—Transport costs and the possible losses due to shut-downs in bad weather have made the closed system useful in those areas where suitable boiler water is not conveniently available. The exhaust steam first passes through a centrifugal type of oil separator, and thence to the main condenser; a vacuum of 12 to 15 inches is maintained by means of a steam jet pump. Further flocculation of oil and solids is effected before filtering and re-use. Illustrations.
A. J. H.

710. How to select and instal braking equipment. A. Fredhold. *World Oil*, Jan. 1953, **136** (1), 135.—The magnitude of the braking force in a wrap-type brake is principally a function of the coeff of friction, the angle of wrap being almost constant. The number and size of bands do not contribute to braking force, although a larger area necessarily reduces the extent of the wear. The effect of wet and oily surfaces and over-heating are larger. The load actually applied at the brake depends on the linkage. The amount of travel and position of brake handle are considered. The main disadvantage of air brakes is the expansive nature of the air, with resultant lower rate of response. A. J. H.

711. Effect of calcium chloride on high early strength cement. B. C. Craft and A. H. Stephenson. *J. Petrol. Tech.*, June 1952, **4** (6), 11–12.—The addition of calcium chloride substantially shortened the pumping time of high early strength cement, and the final set was also shortened. The slurries were 14·7 lb/gal and 15·4 lb/gal, the temps of test being 80° F and 100° F. The amount of calcium chloride was varied, 2% roughly halving setting and pumping times. The cement strength was not greatly affected by small amounts of calcium chloride. The ratio of set volume to slurry volume was increased when calcium chloride was used. The data show that high early strength cement with calcium chloride can be used in accordance with API Code 32, Schedule 2. G. D. H.

712. Measurement of the permeability of set cement. B. E. Morgan and G. K. Dumbauld. *J. Petrol. Tech.*, June 1952, **4** (6), 16.—Well cement permeability tests with air are unrealistic. Water tests are required. A mould is prepared, after a suitable set time the cement is washed, the glazed surface removed by brushing, and the cement mounted in a permeameter. Specimens cast in ungreased moulds gave reproducible permeability results. Air permeabilities were much higher than water permeabilities, due to alteration of the cement on drying. G. D. H.

713. Drilling fluid filter loss at high temperatures and pressures. F. W. Schremp and C. L. Johnson. *J. Petrol. Tech.*, June 1952, **4** (6), *AIMME Tech. Paper No.* 3323, 157–62.—Present methods of measuring filter loss may not be a reliable guide to loss under bottom-hole conditions. Old type muds on test at low temp generally lined up similarly to the order obtained in high temp tests, but this generalization does not

hold for all muds now used. Nevertheless, the API test may still be suitable for the control of a single mud in drilling.

Apparatus for tests up to 5000 p.s.i. and 350° F is described, together with the method of use. The filtration behaviour of drilling fluids is determined largely by the kind, concentration, and particle size of the solids present in the fluids, as well as by hydration and dispersion. Tests were made at 150°, 200°, and 250° F, and pressure differentials of 100, 1000, and 2000 p.s.i. All the muds had been used in wells. Generally the change in filter loss with rise in temp is not linear and differs for each clay–water mud. Many emulsion muds seem to break down at high pressures and temp, and are then no better than ordinary clay–water muds. Emulsions and oil-base muds had increased filter losses at high temp, but the pressure effects were unpredictable. Oil-base muds showed breakdown in some cases. G. D. H.

714. Simultaneous log of radio-activity curves cuts standby time. G. Swift and C. C. Roberts. *World Oil*, Jan. 1953, **136** (1), 122.—Dual recorders on a single chart, and a re-designed subsurface instrument, have permitted the simultaneous γ-ray and neutron logging. A magnetic device on the instrument locates the casing collar, and thus discrepancies due to depth are virtually eliminated. The run is made in the upward direction to maintain a more reliable tension of the cable. Subsurface power is supplied from the surface, thereby cutting out battery difficulties. The operation of the instrument is described with circuit diagrams. Principal advantage of the system is the substantial cut in idle rig time. A. J. H.

715. Hole diameter influences neutron derived porosity. C. B. Scotty and E. F. Egan. *World Oil*, Jan. 1953, **136** (1), 172.—The induced γ-ray radiation is a function of the hydrogen atom concentration in the formation. It follows therefore that where formations are porous, the water and hydrocarbons therein contribute to the effect of induced radiation; according to this, it may be possible to distinguish between sands containing gas, even under high pressure, and oil sands. The neutron–γ-ray log varies logarithmically with porosity. Owing to the nature of shale, the hydrogen atom concentration may give false indication on the log. The effect of hole diameter is measurable, and for diameters above 8 inches the effect is much more developed. A. J. H.

716. What does API signify? W. Müller. *Erdöl u. Kohle*, 1952, **5**, 789–90.—Scope, organization, and standardization procedure of API are described. The four non-USA laboratories (U.K., France, Germany, Australia) which are acceptable in place of U.S. Bureau of Standards as controllers of API reference master gauges are listed, as are German (including Saar) firms who are entitled to use API monogram on certain equipment. V. B.

717. Patents. U.S.P. 2,605,834 (6.1.48; 5.8.52). J. O. Tow, assr to McCullough Tool Co. Perforation gun for well casings.

U.S.P. 2,605,843 (7.7.44; 5.8.52). R. C. Baker, assr to Baker Oil Tools Inc. Well tool anchoring device.

U.S.P. 2,605,844 (30.10.50; 5.8.52). E. H. Clark, assr to Baker Oil Tools Inc. Centering device for well casings.

U.S.P. 2,605,845 (16.8.48; 5.8.52). O. T. Broyles. Well packer.

U.S.P. 2,605,846 (15.8.50; 5.8.52). W. K. Van Brunt and T. W. Hollis, assrs to Shell Development Co. Well-bridging device.

U.S.P. 2,605,847 (24.6.49; 5.8.52). C. J. McCoy. Wet plug for well pipes.

U.S.P. 2,606,000 (2.8.50; 5.8.52). E. Van Cleve. Header block for oil well masts.

U.S.P. 2,606,003 (28.8.45; 5.8.52). J. M. McNeill, assr to Union Oil Co. Off-shore drilling apparatus.

U.S.P. 2,606,004 (15.7.46; 5.8.52). M. H. Hubback, assr to C. E. Hubback. Drill bit.

U.S.P. 2,606,151 (7.5.49; 5.8.52). P. W. Fischer and R. A. Rogers, assrs to Union Oil Co. of California. In the preparation of drilling fluids comprising an aqueous

dispersion of a hydratable clay, a water-soluble polyvalent metal salt, and a water-soluble cellulose ether, complete hydration of the clay in the aqueous phase is ensured prior to the addition of the other ingredients.

U.S.P. 2,606,617 (21.6.46; 12.8.52). J. E. Hall, assr in part to Parker Industrial Products Inc. Cementing shoe for well casing.

U.S.P. 2,606,618 (7.1.49; 12.8.52). J. S. Page, assr to Page Oil Tools Inc. Well packer.

U.S.P. 2,606,620 (14.11.47; 12.8.52). C. L. Deely. Fishing tool for wells.

U.S.P. 2,606,793 (17.2.50; 12.8.52). O. Suter, assr to Technical Oil Tool Corpn. Tool guide.

U.S.P. 2,607,198 (25.5.48; 19.8.52). M. H. Parks, assr to Standard Oil Development Co. Foundation for positioning in semi-fluid soil.

U.S.P. 2,607,422 (3.12.48; 19.8.52). M. H. Parks and M. R. Jones, assrs to Standard Oil Development Co. Method and apparatus for suspending pipe in boreholes.

U.S.P. 2,607,423 (17.9.47; 19.8.52). A. B. Hildebrandt, assr to Standard Oil Development Co. Use of a flexible sleeve in the cementation of boreholes.

U.S.P. 2,607,424 (13.4.46; 19.8.52). C. C. Taylor, assr to McGaffey-Taylor Corpn. Well packer.

U.S.P. 2,607,425 (26.9.47; 19.8.52). C. C. Taylor, assr to McGaffey-Taylor Corpn. Well cementing tool.

U.S.P. 2,607,730 (17.11.49; 19.8.52). D. Ragland, assr to Standard Oil Development Co. Drilling fluid comprising an aqueous suspension of finely divided solids containing an alkali metal hydroxide and pulverulent canaigre root.

U.S.P. 2,607,731 (26.12.50; 19.8.52). P. W. Fischer, assr to Union Oil Co. of California. Drilling fluid prepared by dispersing the following in mineral oil: 0·1 to 5 wt % hydratable clay, 0·1 to 5 wt % alkaline earth metal base, 0·2 to 10 wt % water, and 0·2 to 10 wt % of a dispersing agent comprising a saponified disproportionated rosin obtained by heating rosin in the presence of a hydrogenation catalyst, and a saponified decarboxylated rosin.

U.S.P. 2,608,002 (28.12.50; 26.8.52). W. J. Bielstein, assr to Standard Oil Development Co. Device for indicating inclination of a drill stem during drilling.

J. M. S.

Production

718. A reservoir study of the Pincher Creek Field. F. D. Aaring. *Canad. Min. metall. Bull.*, Nov. 1952, **45**, 671–9.—Brief details are given of the Pincher Creek discovery well No. 1 in the Madison limestone of Mississippian age, and the geology of the field is described. Porosity and permeability data are given of the three producing wells, Pincher Creek No. 1, W. Marr No. 1, and A. Bonertz No. 1. Gas reserves in the reservoir are described, and from the void space calculation it is shown that recoverable gas, to a depletion pressure of 400 p.s.i.a. amounts to 2·54 trillion cu. ft. Assuming the depletion pressure noted, the recoverable reserve is 2·40 trillion cu. ft. Production test data for the three wells are given, and reservoir fluid characteristics are described. From the performance calculations presented, it is shown that on the basis of 2·40 trillion cu. ft. of gas, there would be available—1·92 trillion cu. ft. sweet dry gas, condensate oil, 38·4, natural gasoline, 9·8, propane, 12·7, butane, 10·4 million brl, and 7·4 million tons sulphur. The petrochemical possibilities of this field are widely discussed. W. H. C.

719. Petroleum engineering study of the Quapaw pool, Osage County, Okla. J. A. West. *Rep. Invest. U.S. Bur. Min. No.* 4913, Oct. 1952, 39 pp.—The discovery well in the Quapaw pool was completed in July 1914. Production is from the Bartesville sand at a depth of from 1600 to 1800 ft, with a proved area of 3095 acres. The wells drilled to Jan. 1 1952 totalled 290, with 10·6 acres per well. Active wells at that date were 87. From the reservoir data presented there were 42,022,000 brl oil in place originally, the estimated recoverable oil, by optimum water drive, is 24,454,000 brl, the balance being non-recoverable. Solution-gas drive was the primary displace-

ment mechanism which produced approx 6,520,290 brl, approx 15·5% of the oil in place. Secondary recovery, mainly vacuum and limited gas injection, water flooding only being initiated in 1950, produced to 1 Jan. 1952, 1,518,612 brl and 448,044 brl natural gasoline. Total recovery to the same date being 8,486,946 brl. The estimated recoverable (by water flooding) oil reserves at 1 Jan. 1952 is shown as 7,983,500 brl.

W. H. C.

720. Water flooding in Eastern Kansas and Oklahoma. D. M. Moon. *J. Petrol. Tech.*, June 1952, **4** (6), 17.—To date most of the water flooding in the Oklahoma–Kansas area has been in the Prue, Squirrel, Burbank, Bartlesville, Cromwell, and Tucker sands. These are shoestring and offshore sands. Depths are 225 to 3500 ft, and oil gravities 180° to 40°, with viscosities up to 125 cp. Well spacing is 220 to 1320 ft. Various patterns have been used according to the shape of the sands. Some plug all old wells and re-drill entirely; others retain some old wells and drill some new ones. Salt water for flooding is obtained chiefly from the Mississippi limestone and the Wilcox. Cement-lined pipe is used. There are some closed systems. For depths less than 1000 ft 2- to 3-acre spacing is used. Generally water input rates are below 4 brl/ft in shallow areas, and if oil viscosity exceeds 35 cp, rates under 2 brl/ft are recommended.

Some floods are pumped, some are flowed from the beginning. 10-acre spacing is usual for depths of 1000 to 2000 ft. Input rates are 10 to 15 brl/ft. For greater depths the same spacing is preferred, with input rates up to 40 brl/ft and little new drilling.

Breakdowns due to fractures are encountered in the shallower floods. There are thief sands in places. Most serious corrosion problems are in the producing wells.

G. D. H.

721. Inverted-type packer solves salt water injection problem. G. S. Flanders. *World Oil*, Jan. 1953, **136** (1), 186.—Injection of salt water necessarily involves many difficulties in corrosion problems. By setting a reverse packer, one which fits more effectively with increase in upward thrust, it is possible to confine the corrosive brine to the minimum casing length. The packer is run on tubing, with a tail pipe extending some distance below the packer. Oil is circulated, and the packer set. In this way the corrosive brine does not come into contact with the packer, and the major part of the casing is oil-protected. Oil settles above the brine, but an extra length is required to account for the turbulence associated with the discharge of brine into the well. The material of the packer should be as similar to that of the casing as possible to reduce galvanic action.

A. J. H.

722. A method for determining permeability of consolidated sands. M. Killer. *Nafta* (*Yugoslavia*), **3** (10), 315–27.—A method for the determination of the effective permeability of consolidated sands to air or other suitable gases is described in detail, including preparation of rock samples, *i.e.*, cutting of appropriate core plugs by means of diamond tools, and extraction with toluene. The core is fixed in a rubber stopper, and the volume of fluid is measured with a soap film, travelling along a graduated burette and placed in a position, slightly inclined from horizontal. The Darcy equation is given in a form which enables direct inserting of experimental data, thus shortening the time necessary for computing permeability in millidarcys to a few minutes only. The reproducibility of the method is 2% from mean.

723. New multiple fracturing process. G. Howard and W. G. Bearden. *World Oil*, Jan. 1953, **135** (1), 159.—Since the introduction of the system of increasing well productivity by fracturing, many new ideas have been put forward. This system consists in developing several fractures in a well, by single or multiple batch treatment. The treatment is successive; the nature of the suspension is such that, subsequent to fracturing a zone by hydraulic pressure, the particles plug off that zone and the increase in pressure then serves to fracture another zone. The plugging agent must be effective in sealing the initial, or immediately previous, zones to allow the application of the substantially higher pressures. After fracturing it is necessary that the agent be removed, in this case by solution, to permit the resumption of production. The more suitable suspension is that of ground pellets of naphthalene, which dissolve in crude oil after a certain contact time, depending on local conditions. The results are good:

84% success, as opposed to 70% for single fracture system, and 245% increase as opposed to 185%. Whether or not sustained increase in production is obtained depends on the well characteristics. Refs. A. J. H.

724. 28,000 brls of brine disposed daily in six wells. J. F. Armstrong. *World Oil*, Jan. 1953, **136** (1), 164.—A description of the collective system for the disposal of brine from about 16,500 acres of oil leases. Gravity flow lines, mainly vitrified tile pipe, were laid to the collecting sumps, where sedimentation is allowed for. More recently, a fibre pipe has been used where possible, or, in the case of high brine temp, cement asbestos pipe was laid. In anticipation of high injection pressures positive displacement pumps were installed, but now, except for one such pump, centrifugal pumps have replaced these, and are satisfactory; the pressures have been found to be less than anticipated. A. J. H.

725. New method estimates gas well performance. D. Cornell. *World Oil*, Jan. 1953, **136** (1), 180.—A method is outlined for estimation of gas reserves requiring only a short test period. The basis of the method is theoretical, and has given good agreement; it has advantages over empirical methods. Data are presented graphically. Refs. A. J. H.

726. How to pump deep dual completions alternately. J. R. Hatfield. *World Oil*, Jan. 1953, **136** (1), 188.—A description of the tool assembly in use. Its operation involves the periodic use of a pulling unit. It is recommended that one zone be pumped for one half of the month, the other for the remainder. A. J. H.

727. Visual examinations of fluid behaviour in porous media—Pt. I. A. Chatenever and J. C. Calhoun. *J. Petrol. Tech.*, June 1952, **4** (6), *AIMME Tech. Paper No.* 3310, 149–56.—The flow cells consisted of a single layer of glass or lucite spheres between two flat plates. Lucite bases with a glass or lucite window were used. 0·007-inch-dia spheres were used. Positive displacement pumps provided the means of moving fluids through the cells. Hypodermic syringes with micrometer heads were used in one set of experiments, and these were controlled by a motor. Zenith gear pumps also were used.

The behaviour of the fluids was recorded by colour cinephotomicrography. Details of the optical and other arrangements are given.

In channel flow each fluid moves through its own network of interconnecting channels. The channels varied in dia from one grain dia to many. They may be tortuous. Liquid interfaces were stationary for steady flow, but the geometry of the channels changed with change in liquid saturation. Flow in any channel seemed to be streamline. Velocities were up to 1000 ft/day, oil viscosity 15 cp, interfacial tension 6 dynes/cm, flow ratios $\frac{1}{3}$ to 3.

At slightly under 2000 ft/day slug flow began. In an all-glass matrix the oil formed the slugs. This regime held in the range of flow ratios $\frac{1}{3}$ to 3, and slug frequency and coalescence increased with rate of flow. In lucite spheres water formed the slugs.

Flooding was studied. Residual masses were left behind, and these were not displaced even by very high flood rates. Pendular rings were noted. The observations are discussed in terms of other published work. G. D. H.

728. Experimental evaluation of well perforation methods as applied to hard limestone. H. Lewelling. *J. Petrol. Tech.*, June 1952, **4** (6), *AIMME Tech. Paper No.* 3322, 163–8.—3¾-inch-dia hard dolomitic cores 10 to 12 inches long, with squared ends were soaked in water and mounted in a cement aggregate in a steel capsule made of 7-inch casing sealed at one end. The mount was kept under 50 atm nitrogen pressure to keep voids at a minimum while the cement set for three days. Any cracks were drilled out and packed with neat cement. Ten samples were mounted vertically so that shots entered perpendicular to the bedding planes; four were mounted so that the shots were parallel to the bedding planes. All were covered with 1·4 inches of neat cement, and all but four had a disc of ½-inch boiler plate on the wet cement. Gun holders of 8-inch pipe were made. Type A gun fired 1⅛ × 15/32-inch bullets fired by 15 gr of powder. Target distance was 1 inch. A standard 2-gm shaped charge was used with a 1-inch target distance for all but two cases. The assembly was submerged in water for firing.

The thickness of boiler plate and cement cover were subtracted from the total penetration, and the remainder was reported as depth of penetration. In bullet holes total penetration was measured to the base of the bullet. On this basis average jet penetration was 3 inches, average bullet penetration 0·2 inch. This assumes no fracturing, compacting, etc. Bullets and jets caused considerable fracturing. This was most extensive with shaped charges, $\frac{1}{8}$–$\frac{1}{4}$ inch; around the jet the rock is almost powdered.

It seems that in casing perforating with shaped charges may cause less fracturing of the cement layer than does a bullet. G. D. H.

729. Experimental study of the volumetric behaviour of crude oils and natural gases. A. Houpeurt and J. Curutchet. *Rev. Inst. franç. Pétrole*, Aug. 1952, **7**, 267–79.—The common fall of the reservoir pressure in oil and gas exploitation leads to changes in the properties of the fluids. Specific volume and viscosity change, and there are also changes in passages to surface conditions which must be studied. Economic considerations make it necessary to understand the mechanism involved when crude oil and its contained gas are separated. Equipment for these studies has been made at great cost.

The theory, construction, and mode of use of apparatus for P-V-T studies of dry gas are briefly described. Saturation pressures, shrinkage, gas solubility, and viscosity are examined for crude oils and natural gas, and in this case also the equipment is described together with its operation. A rolling ball viscometer is used. Further equipment has been constructed for the investigation of retrograde condensation.

G. D. H.

730. Thermodynamic study of a crude oil. J. Curutchet, R. Molinero, and R. Fagegaltier. *Rev. Inst. franç. Pétrole*, Aug. 1952, **7**, 283–90.—The crude oil came from the bottom of OG. 19 in the Oued Gueterini (Algeria) oilfield. The properties measured and the data presented graphically are the pressure–volume relations of the gas/oil system and the bubble point; the vol factor and density of the liberated gas; the vol factor and specific gravity of the oil; gas solubility. All are plotted against pressure in the range 0 to 40 kg/cm². G. D. H.

731. Thermodynamic study of a gas-condensate. J. Curutchet, R. Molinero, and R. Fagegaltier. *Rev. Inst. franç. Pétrole*, Aug. 1952, **7**, 291–8.—The experimental material was obtained from the surface separator at well CB. 5 at the Cap Bon field, Tunisia. Graphs and tables present data on the specific volume and compressibility of the reservoir fluid at pressures up to 250 kg/cm², and the results of flash and differential condensation. The compositions of the gas and liquid are given. G. D. H.

732. Compressibility factor of a natural gas. J. Curutchet, R. Molinero, and R. Fagegaltier. *Rev. Inst. franç. Pétrole*, Aug. 1952, **7**, 280–2.—The gas studied came from the separator at well CB. 5, of the condensate reservoir at Cap Bon (Tunisia). This has been examined at 10°, 20°, 40°, 60°, and 80° C, and pressures of 0 to 250 kg/cm². The gas had 79·3% (mol) CH_4, 11·7° C_2H_6, 5% C_3H_8, 2·6% C_4H_{10}. The compressibility factor Z has been computed, and the experimental and calculated values (from Katz' empirical diagram) are tabulated. The max difference is 2·9%, and the mean difference about 1·5%. G. D. H.

733. Study of the capillary characteristics of the Cap Bon reservoir by Purcell's method. P. Albert and L. Butault. *Rev. Inst. franç. Pétrole*, Aug. 1952, **7**, 250–66.—The apparatus employed had a sample chamber capable of withstanding an internal pressure of about 100 kg/cm², and could hold a specimen 2·3 cm high and 2·2 cm dia. The internal volume of this holder is fixed. The apparatus is described in some detail. Measurements can be made up to pressures of about 6·5 kg/cm². The expansion of the chamber under pressure has been noted, since a correction for this may be important for low porosity specimens. The method of using the apparatus is described.

Seventeen core samples from Cap Bon 5 well were examined. They were from depths of 1729·2 to 1735 m. Porosities ranged 12·3 to 16·75%. The air permeabilities, corrected for the Klinkenberg effect, ranged 0·22 to 11·3 mD. The samples were sometimes perpendicular to the core axis. Some were side by side. The pressure–saturation relationships with mercury were obtained for each sample.

The dimensions fixing the pressures are the throat sizes, not the pore sizes. Angles of contact may not be constant throughout a rock sample because of differences in the state of the surfaces. The specimens had irreducible water saturations of 15 to 29%. Studies of the lithological factor, which is used in linking permeability with capillary characteristics, show values which differ according as the samples are parallel or perpendicular to the core axis. Investigations have been made of the relations between throat size and the pore space accessible, and the curves show a sharp max at about $r = 3\mu$, and this position is related to the permeability value.

The amount of residual oil left in the cores has also been studied. It ranged 17 to 27%. G. D. H.

734. Patents. U.S.P. 2,605,712 (6.11.48; 5.8.52). L. F. Davis, H. N. Stansbury, and M. O. Crumbaker, assrs to Atlantic Refining Co. Hydraulic pumping system for producing from a plurality of subterranean reservoirs through a single bore traversing the reservoirs.

U.S.P. 2,605,717 (6.5.48; 5.8.52). G. Canon. Pump for wells.

U.S.P. 2,606,500 (24.6.46; 12.8.52). B. F. Schmidt. Fluid actuated double-acting deep well oil pump.

U.S.P. 2,606,616 (19.3.48; 12.8.52). H. C. Otis. Well treating and flow controlling device.

U.S.P. 2,606,871 (27.4.51; 12.8.52). K. C. Ten Brink, assr to Texas Co. In production of petroleum from a well extending into a porous, oil-bearing formation which also contains water, formation around the well is rendered preferentially oil wettable by injecting into the said formation a salt of rosin amine.

U.S.P. 2,607,220 (14.4.47; 19.8.52). P. W. Martin. Device for measuring pressure and temp in a well.

U.S.P. 2,607,221 (18.5.46; 19.8.52). E. C. Babson, R. R. Ormsby, and M. C. Turner, assrs to Union Oil Co. Flowmeter for determining flow rate of fluids in an oil well.

U.S.P. 2,607,222 (28.5.46; 19.8.52). J. H. Lane. Formation tester.

U.S.P. 2,607,299 (11.4.49; 19.8.52). G. R. Cole. Gas lift pump for oil wells.

U.S.P. 2,607,426 (4.9.47; 19.8.52). W. D. Rose, assr to Standard Oil Development Co. Pumping technique to prevent excessive water coning.

U.S.P. 2,607,427 (29.8.46; 19.8.52). D. C. Bond and M. Savoy, assrs to Pure Oil Co. Composition for sealing wells comprising hemihydrate calcium sulphate, hydrated calcium sulphate prepared from gypsum, and an acid amide.

U.S.P. 2,607,428 (29.8.46; 19.8.52). D. C. Bond and G. G. Bernard, assrs to Pure Oil Co. Composition for sealing wells comprising hemihydrate calcium sulphate, an acid amide, and a non-alkaline water soluble set retarding agent for the sulphate.

U.S.P. 2,608,256 (15.8.49; 19.8.52). D. T. Matthews. Heater for oil wells and pipe lines. J. M. S.

Oilfield Development

735. The distribution of the oil reserves of the world. G. M. Lees and D. C. Ion. *J. Inst. Petrol.*, 1952, **38**, 919–28.—The problem of the definition of oil reserves is discussed and an analysis of present and possible future oil reserves is presented. A. R. W. B.

Transport and Storage

736. El Paso Natural completes a circle of communication. Anon. *World Oil*, Jan. 1953, **136** (1), 203.—The operating areas of the El Paso Natural Gas Co. were such that public communications were non-existent; the company is now responsible for about 4600 miles of telephone lines and nineteen radio stations, and the micro-wave link. A full description is given of the facilities now available. A. J. H.

737. Expansion projects total more than 30,000 miles. P. Reed. *Oil Gas J.*, 26.1.53, **51** (38), 297.—Tables show U.S.A. crude oil, products, and natural-gas pipelines planned, under way, and completed. The longest line to be built is an 8-inch of 600 ml length. G. A. C.

738. Laying of a group of pipes across the south Elbe. A. Becker and P. Brüdern. *Erdöl u. Kohle*, 1952, **5**, 725–7.—Illustrated description of linking of two sections of Shell Harburg plant, separated by 330 m wide, 9 m deep Elbe river. Bundle of eight seamless rolled pipes (150 to 250 mm dia) having a suitable radius of curvature (200 m) were welded in position on bank (joints annealed and then tested ultrasonically) and then pulled across river by locomotives at 0·25 m/sec, pull of 25 to 30 tons being required. Operation completed within 1 hr. Total transfer capacity is 200 m^3/hr. V. B.

739. Pipeline transport of viscous high-pour crudes. Cost comparison of below- and above-ground lines. K. Westphal. *Erdöl u. Kohle*, 1952, **5**, 785–9.—Calculations and discussion are based on following data: line length 20 km, buried line 6 inches dia laid at depth of 1 m, surface line 5 inches dia lagged with 80 mm glass wool. Pumping pressure 50 atm, external temp (German winter) −10° C, earth temp +5° C. Two sets of pumping conditions considered, 11,500 or 29,000 tons/month. Crude has setting point +8° C, visc E_{20} 115°, E_{50} 10·5°. Max heating of crude 60° C, final crude temp <20° C. Heat losses of both lines are approximately equal at throughput of about 5500 tons/month, above this figure above-ground line has the advantage. Owing, however, to greater capital cost of lagged line (approx double) overall operating costs only equalize at about 11,000 tons/month with increasing economy of above-ground line over this figure. Choice between above- and below-ground lines can hence only be made on consideration of all factors in each individual case. V. B.

740. Stress failure in big-inch gas-transmission pipe. J. W. Lodge and G. K. Manning. *Oil Gas J.*, 17.11.52, **51** (28), 344.—A study of stresses in short sections of buried pipe shows that small flat spots and dents in thin-wall, large-diameter pipe will cause large local bending stresses when internal pressure is applied to the pipe, which stresses are likely to cause local plastic deformation the first time pressure is applied to line. Proof-testing pressure should be at least 150 p.s.i. higher than maximum operating pressure. G. A. C.

741. Radioactive isotope—equipped go-devil cuts costs for Anglo-Iranian. Anon. *Oil Gas J.*, 19.1.53, **51** (37), 91.—A 75-milliecurie cobalt 60 source is used in conjunction with a light monitor-type detector for normal working of a pipeline to locate a go-devil. Equipment is described and pipeline tests discussed. G. A. C.

742. Shell pipelines crisscross seven states. Anon. *World Oil*, Jan. 1953, **136** (1), 216.—A summary of the development of Shell pipelines from the early 1900s with 16 miles of 4-inch line, to present commitments involving about 5000 miles of line. A. J. H.

743. New code for gas piping on way. D. M. Taylor. *World Oil*, Jan. 1953, **136** (1), 210.—A sub-committee of ASA is concerned with the revision of codes relating to the design, construction, and operation of gas systems. The primary work was the combination of all codes into one group; the committee is now engaged in the revision of these collected codes. A. J. H.

744. Tankers of 20,000 tons D.W.C. and above. Anon. *Mot. Ship*, Jan. 1953, **33** (394), 426.—A review is given of tankers building and on order in European, Japanese, and American yards. Details are tabulated. U. M.

745. Control of internal corrosion of tankers. Pt 1. The nature of corrosion and its control. W. B. Jupp. **Pt 2. Inhibitors in cargo.** J. Malcolmson, W. Quimby, G. Pingrey, and J. Oosterhout. *Mot. Ship*, Jan. 1953, **33** (394), 443.—Data on corrosion rates with different types of cargo and conditions of tanks, *i.e.*, loaded, ballast,

empty, and cleaned, are presented. The cargo, whether clean or dirty, is an excellent insulator, and it inhibits corrosion where the tank is loaded with cargo. Heavier petroleum leaves a coating on steel, and so protects an empty tank. Gasoline, however, cleans the steel, which is then exposed to corrosion when moisture is present. Cleaning with seawater accelerates corrosion rate. Methods of corrosion control are roughly divided into mechanical and electrochemical, and effectiveness of various types of each are assessed for the four conditions of tank.

Pt 2 first enumerates the disadvantages of painting, dehumidification, metallic coating, cathodic protection, and use of water-soluble inhibitors for corrosion reduction. Results of tests with Santolene C, an oil-soluble, surface-active inhibitor, are presented. Laboratory tests showed that Santolene C gave good protection against rust and had no detrimental effect on fuel stability. Results of ship tests are tabulated, and they show that, although rust formation was evident in all tanks, the inhibitor caused a marked improvement in those tanks in which it was used. U. M.

746. Evaporation loss from storage tanks. Anon. *Oil Gas J.*, 17.11.52, **51** (28), 266.—This is a three-part symposium. Pt 1 deals with basic theory and mechanism of evaporation, Pt 2 with evaporation from cone roof tanks, and Pt 3 with evaporation from conservation-type tanks. G. A. C.

747. Patents. U.S.P. 2,605,780 (13.12.49; 5.8.52). W. T. Nance, assr to Shell Development Co. Automatic system for selectively controlling the flow of fluid from a common source into a tank of a multiple-tank battery.

U.S.P. 2,606,656 (14.6.50; 12.8.52). P. F. Dougherty, assr to Sun Oil Co. Method of packing and storing cakes of wax involving the use of water absorbent water wet separating sheets between the wax surfaces.

U.S.P. 2,606,663 (24.5.50; 12.8.52). G. R. Blackman and C. J. McWhorter. Strainer for pipelines and means for cleaning same.

U.S.P. 2,606,684 (6.12.48; 12.8.52). J. H. Wiggins. Floating tank roof.

U.S.P. 2,606,698 (New Zealand 12.10.44; 12.8.52). B. J. Todd and R. C. Turner, assrs to Associated Motorists Petrol Co. Ltd. Means for delivery of liquids from containers. J. M. S.

Refinery Operations

Refineries and Auxiliary Refinery Plant

748. Refining capacity undergoing substantial expansion. R. B. Tuttle. *Oil Gas J.*, 26.1.53, **51** (38), 308.—Active refinery-building projects in the U.S.A. and Canada are listed, showing capacity rating, status, completion schedule, and contractors. G. A. C.

749. Construction at Coryton. Anon. *Petroleum, Lond.*, Jan. 1953, **16** (1), 6–7.—Reviews construction progress at Vacuum Oil Co. refinery at Coryton, Essex. Some units have been put into operation, and others, which include the distillation and Thermofor air-lift cat cracking unit, are in an advanced stage of erection. R. E. P.

750. The Isle of Grain Refinery. Anon. *Petroleum, Lond.*, Jan. 1953, **16** (1), 8–9.—Describes construction progress at Kent Anglo-Iranian refinery. The dist plant has been completed, and the cat cracker (10,000 brls/day capacity) and associated units will shortly be ready to go on stream, although the final stages of the refinery will not be finished until 1954. R. E. P.

751. Progress at Fawley. Anon. *Petroleum, Lond.*, Jan. 1953, **16** (1), 10–11.—Briefly reviews the installation of auxiliary units due to come into operation in 1953. Construction has kept to schedule, and during the first twelve months of operation production has been well up to expectation; 600 million tons of Middle East crude were processed. R. E. P.

752. Grangemouth developments. Anon. *Petroleum, Lond.*, Jan. 1953, **16** (1), 12–13.—Briefly describes constructional modifications and additions to the Scottish Oils refinery at Grangemouth, which is due to be completed in 1953. R. E. P.

753. New plant at Stanlow. Anon. *Petroleum, Lond.*, Jan. 1953, **16** (1), 14–15.—Describes the cat cracker and sulphur plants which began production in 1952, together with the cooling water installation. R. E. P.

754. Llandarcy refinery. Anon. *Petroleum, Lond.*, Jan. 1953, **16** (1), 18.—Reviews developments in 1952. R. E. P.

755. Manchester oil refinery expansion. Anon. *Petroleum, Lond.*, Jan. 1953, **16** (1), 16–17.—Describes the programme of expansion during 1952. R. E. P.

756. Development of Britain's smaller refining companies. Anon. *Petrol. Times*, 6.2.53, **57** (1448), 110.—The progress is described of Berry Wiggins and Co. with their plants at Kingsnorth, Weaste, and Ellesmere Port specializing in production of bitumen, bitumen emulsions, cutbacks, a range of bitumen compounds, and oils for industrial uses. G. A. C.

757. Development of the petroleum refining industry and scientific research into petroleum refining during the Stalin five-year plans. S. R. Sergienko and A. L. Rabkina. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1952, 1618–33.—Review, in very general terms, of progress of pet refining industry during periods 1928–32, 1933–37, 1938–42, 1946–50, and programme set for 1951–55. This includes a doubling of the straight refining capacity, an increase in cracking capacity by 2·7 times, the development of submarine pet deposits, and the siting of refineries nearer to consumption centres. 1955 production is planned to show an increase of 85% over 1950. V. B.

758. Heat transfer. B. E. Lauer. *Oil Gas J.*, 17.11.52, **51** (28), 425; 5.1.53, **51** (35), 82; 19.1.53, **51** (37), 155; 26.1.53, **51** (38), 400.—No. 12 in this series continues with coeffs of heat transfer through film between inside surface of cool tube and warm liquid.

No. 18 in this series continues with coeff of heat transfer through film between inside surface of a warm tube and cool liquid.

Pt. 20 of this series continues with coeff of heat transfer through film between inside surface of a cool tube and warm liquid.

Pt. 21 of this series continues with coeff of heat transfer through film between inside of warm tube and cool gas. G. A. C.

759. The centrifugal compressor—3. C. F. Koening. *Oil Gas J.*, 19.1.53, **51** (37), 129.—No. 38 in Engineering Reference Section discusses effect of controlled preswirl, and figures show effect of inlet guide vanes on velocity diagrams. G. A. C.

760. The centrifugal compressor—4. C. F. Kuema. *Oil Gas J.*, 26.1.53, **51** (38), 395.—This part of the Engineering Reference section deals with compressor station operation, and a figure shows constant speed performance with adjustable inlet guide valves. G. A. C.

761. Sealing properties of plane copper rings in pressure vessels. A. Bartel. *Erdöl u. Kohle*, 1952, **5**, 724—Investigation was made of the effect of shape of seating on tightness of soft-annealed copper (tensile strength 25 kg/mm², thickness 1·5 mm) gaskets. Plane seatings (width 3·5 mm.) were tight at 60° C and 250 atm, but failed at 100° C, cone-shaped seatings were likewise unsatisfactory. A serrated seating (0·8-mm serrations) increased sealing efficacy by 120%; after cooling and re-heating to test temp the joint was still tight. V. B.

762. Hydraulic pumps and transmission systems. J. R. Fawcett. *Mech. World*, Jan. 1953, **133** (3402), 28.—A variable delivery axial piston pump that can be used as a hydraulic motor is described and illustrated. When pump and motor are mounted as

a unit, power can be transmitted at constant torque over an infinitely variable speed range. Alternatively, the power output of the motor can be limited to a predetermined figure. Details of a radial piston rotary cylinder pump, a fuel injection pump, and variable types of pistonless pumps are given. Advantages of hydraulic drives are discussed, and their application to a Thames tug and film processing are commented upon. T. T.

763. Fans and blowers—11. M. van Winkle. *Oil Gas J.*, 17.11.52, **51** (28), 419.—No. 30 in the Engineering Reference Section shows how to use fan laws in figuring fan performance. G. A. C.

764. Blower and fan costs. R. E. Denzler. *Chem. Engng*, 1952, **59** (10), 130–4.—The cost in dollars of blowers can be determined from graphs plotted against capacity, with b.h.p., pressure, and prime mover as parameters. Price modifications for different materials of construction, temperature, and mechanical variations are quoted for March 1952. D. H.

765. Drying with superheated steam. E. F. M. Van der Held. *Ingenieur, 's Grav.*, 9.1.53, **65** (2), Ch. 1–5. (Cf. Abstract No. 93.)—In this second article the drying with superheated steam is treated. In the first seconds the surface is heated up to the boiling point by condensation. Then evaporation starts, but this phenomenon is much slower than the condensation. Formulæ describing both processes are given.

Comparison of the drying by superheated steam and air of the same temperature shows that the drying by air is more efficient than by superheated steam.

G. F. T. C.

766. Metals and coatings to combat corrosion. H. F. McConomy and J. J. Hur. *Petrol. Engr, Ref. Annual*, 1952, **24** (8), C28–30. (*API Refining Divn mtg, San Francisco, May* 1952.)—The use of protection coatings, alloyed installations, and heavier gauge steel plates to combat internal corrosion of steel tank roofs are discussed in economic terms. It is concluded that: (1) aluminium or galvanized steel may be justified for severe corrosive conditions; (2) the use of increased thickness of steel plate merits greater consideration; and (3) extensive use of coatings must be based on field trials. E. K. J.

Distillation

767. Evaporation from liquid surfaces in a vacuum. K. Hickman and D. J. Trevoy. *Vacuum*, Jan. 1952, **11**, 3–17.—Previous investigations in high vacuum dist have suggested that evaporation coeffs ranging from 1 to 25% of those calculated by the Knudsen–Langmuir formula are common. The author's experiments were predicated on the theory that liquids, irrespective of constitution, will show coeff of unity from new, clean surfaces and that the same liquids in the state of out-of-the-bottle purity or less will show fractional coeffs. The clean surface experiments were done with a falling-stream rate tensimeter, the soiled surface with various observation-post pot stills. When the equilibrium pressure is above 10 μ a soiled surface becomes schizoid, divided into working and torpid areas. The working area has a coeff near unity, the torpid two to one hundred times less. An expanding surface, as in a growing bubble, has a higher coeff than a contracting surface, and more vapour is emitted behind the stirring paddle than in front. A technique has been devised for making exact measurements of vapour emission from stretched and pushed surfaces. As the surface reaches pristine cleanliness, the evaporation coeff becomes unity, and does not diminish with later ageing of surface. Pristine surfaces are not ordinarily encountered, and proneness to superheat is an indication of the impaired permeability of a liquid's surface. (Authors' Abstract.) W. H. C.

768. Distillation of petroleum. K. K. Rumpf. *Erdöl u. Kohle*, 1952, **5**, 745–7.—Brief elementary account of principles underlying pet dist, including atmospheric, vac, and pressure dist. Remarks concerning constructional materials, operating conditions, and dist products are included. V. B.

769. Modern bubble-tray construction—1. H. C. Glitsch and R. W. Fowler. *Oil Gas J.*, 19.1.53, **51** (37), 135; 26.1.53, **51** (38), 397.—This issue of the Refiner's Notebook deals with factors concerned in design of efficient bubble-trays and effect of pressure surges on trays.

The following issue of Refiner's Notebook discusses use of various steels for bubble caps and trays in service, and effect of velocity on erosion. G. A. C.

770. Stabilization of high gravity condensate and production of natural gasoline. L. L. Laurence and C. W. Hughes. *Petrol. Engr, Ref. Annual*, 1952, **24** (8), C18–26. (*API Production Divn mtg, Shreveport, La., March* 1952.)—The low temp separation and stabilization processes for improving yields from gas condensate wells are described. The formation of hydrates in both processes may be prevented by incorporation of glycol injection system. Flow diagrams and recoveries are presented for each production method. E. K. J.

771. Patents. Ger.P. 851,633, 7.8.52. H. V. Kohrt and R. Jauernik, assrs to Metallges A.G. Process and device for operating dist and scrubbing columns.

Ger.P. 851,635, 7.8.52. H. Ratte. Process and device for heating dist columns.

Ger.P. 853,751, 28.8.52. A. Schmitz and H. Tramm, assrs to Ruhrchemie A.G. Process and device for automatic regulation of top temp in continuous dist apparatus.

Ger.P. 853,752, 28.8.52. F. Campe, assr to Chloberag Chor Betrieb Rheinfelden A.G. Device on bubble-tray columns with adjustable bubble-caps.

Ger.P. 853,286, 21.8.52. F. A. Weber and P. M. Müller, assrs to Chem. Fabr. Curtius A.G. Reaction towers with filler material filling.

Ger.P. 853,159, 21.8.52. W. Pfannmüller, assr to Bad. Anilin- & Soda-Fabr. Filling materials.

Ger.P. 853,287, 21.8.52. M. Fischer, assr to Bad. Anilin- & Soda-Fabr. Filling materials for columns.

Ger.P. 853,220, 21.8.52. H. Tramm, H. Kolling, A. Schmitz, and T. Notthoff, assrs to Ruhrchemie A.G. Dist apparatus for laboratory and semi-tech purposes. *BrennstChemie*, 1952, **33** (17–18). R. T.

Absorption and Adsorption

772. Adsorption. Anon. *Chem. Engng*, 1952, **59** (10), 149–68.—The chief industrial methods of separation by liquid and vapour phase adsorption are described. Future trends in hypersorption, contact filtration, ion exchange, and fractionation are discussed. D. H.

Cracking

773. Thermofor catalytic reforming. An answer to demand for higher octane numbers. J. W. Payne, L. P. Evans, E. V. Bergstrom, and V. O. Bowles. *Oil Gas J.*, 17.11.52, **51** (28), 357.—Bench-scale studies on synthetic chromia–alumina gel cat for reforming petroleum naphthas led to the construction of a 50-b.d. moving bed and a large-scale unit plant which are described. Properties and yields are tabulated, and economics for a 30,000 b.d. mid-Continent refinery discussed. G. A. C.

774. Houdriforming at low pressure. J. C. Dart, A. G. Oblad, and J. W. Schall. *Oil Gas J.*, 17.11.52, **51** (28), 386.—Data are presented which indicate that excellent yield–octane relationships and high octane numbers can be obtained with Houdriforming cat in a relatively low-pressure operation. G. A. C.

775. Fluid catalytic cracking wax distillates from Middle East crudes. Research Staff of Anglo-Iranian Oil Co. Ltd. *J. Inst. Petrol.*, 1952, **38**, 936–63.—A correlation of product yields and qualities with conversion obtained in cracking a typical wax distillate feedstock over silica–alumina catalyst in a pilot unit has been obtained for both

once through and recycle operations. The effects of varying crude source of feedstock and feedstock boiling range from one crude have been studied, and results are discussed in relation to full-scale processing at max carbon burning capacity of the regenerator.
A. R. W. B.

776. Patents. Ger.P. 852,847, 14.8.52. H. Welz, assr to Bad. Anilin- & Soda-Fabr. Method for producing highly-branched paraffinic hydrocarbons from naphthenic hydrocarbons.

Ger.P. 854,210, 28.8.52. H. Welz, assr to Bad. Anilin- & Soda-Fabr. Process for hydrocarbon conversion.

Ger. P. 852,886, 14.8.52. H. Tramm, assr to Ruhrchemie A.G. Procedure for improving output of existing cracking installations.

Ger.P. 853,486, 21.8.52. E. Donath, assr to Bad. Anilin- & Soda-Fabr. Cracking technique with middle and heavy oils in the liq phase.
BrennstChemie, 1952, **33** (17–18). R. T.

Polymerization

777. Patents. Ger.P. 854,213, 28.8.52. W. von Füner, K. Peters, and G. Free, assrs to Bad. Anilin- & Soda-Fabr. Process for polymerization of hydrocarbons.

Ger.P. 852,764, 14.8.52. R. Schäff, assr to Farbwerke Hoechst. Process for polymerization of ethylene compounds.
BrennstChemie, 1952, **33** (17–18). R. T.

Alkylation

778. Patent. Ger.P. 852,990, 21.8.52. W. Schreiber, W. Demann, and H. Steuer, assrs to Krupp Kohlechemie G.m.b.H. Method for production of alkylchlorides.
BrennstChemie, 1952, **33** (17–18). R. T.

Isomerization

779. Patent. Ger.P. 854,344, 28.8.52. F. Fogel and F. Blümel, assrs to Bad. Anilin- & Soda-Fabr. Process for converting tech *n*-butane into *iso*butane.
BrennstChemie, 1952, **33** (17–18). R. T.

Chemical and Physical Refining

780. La chlorination dans la valorisation des hydrocarbures. G. Souillard and J. C. Jungers. *Proc. Third World Petrol. Congr.*, 1951, **5**, 31–9. (In French.)—Chlorination is a method used to separate the constituents of petroleum. The kinetics of these reactions, with the chlorine activated photochemically, catalytically, or thermally, are reviewed and their industrial application studied. E. S. L.

781. Electrolytic regeneration of treating solutions. O. J. Zandona and C. W. Rippie. *Petrol. Engr, Ref. Annual*, 1952, **24** (8), C11–16.—The removal of mercaptans from gasoline enhances lead susceptibility with consequent savings in T.E.L. treating costs. The new electrolytic caustic regeneration (ADC) process gives improved efficiency and economy of caustic treatment of gasoline as shown by analysis of the overall treating costs, including T.E.L. addition. The ADC caustic regenerator consists of sixty cells in series with nickel plated, cast iron electrodes separated by rubber gasketed vulcanized asbestos diaphragms. Spent caustic flows through two headers in the bottom of the plate and then upward across each plate where electrolysis occurs. Regenerated caustic and oxidized mercaptan flow out through two headers at the top of the plate. Electrodes are either 2 or 3 ft square, and the cells utilize 45 or 90 kW respectively. Nominal flow rates of 1700 or 3400 b.d. are quoted. Disulphides are separated from regenerated caustic by settling, and final traces are removed by passing the caustic through naphtha in a scrubber packed with Raschig rings. Operating costs are compared with those for the steam regeneration process and show a reduction from $16

to $2 per 1000 brl gasoline treated. Other advantages are reduced maintenance and capital costs and elimination of mercaptan vapour disposal. T.E.L. savings of $15 per 1000 brl gasoline treated are indicated. Gum formation, by resinification of organic materials in sour gasoline on heating, is reduced, with consequent savings of 50% in cost of inhibitor. Annual consumption of caustic is reduced. Disadvantages include high voltage hazards, filtration of plant treating solutions, and housing of cell and rectifier. E. K. J.

782. Desulphurization of diesel fuels. W. Ohme. *Erdöl u. Kohle*, 1953, **6**, 8–10.—Thermally cracked gas oil from topped Iraq crude had 2% S and was treated with (*a*) doctor soln (12·5% NaOH, 6%PbO), (*b*) acid CuCl (12·5% + 6% HCl), (*c*) alkaline CuCl (15% + 15% NaOH), (*d*) 10% Na_2S. (*a*) and (*b*) only reduced S slightly (to 1·5, 1·3%), (*c*) and (*d*) had practically no effect. Similar results were obtained when gas oil had been previously cat desulphurized. S content was reduced to acceptable limit (just below 1%) by vap phase contacting (460° C) with bleaching earth, washing condensate with 100% of 5% NaOH, water washing and redist to original b.p. of 200° to 350° C, yielding 1 to 2% gasoline, 5% polymer with b.p. >350° C; overall yield was 88 to 90%. Clay consumption was 10% on feed, but spent clay from refining of cracked gasoline can be used and regenerated. Admission of air or steam to feed vapour or addition of CuO to earth did not improve process efficacy. V. B.

783. Patents. U.S.P. 2,609,931 (17.4.48; 9.9.52). C. A. Rodman and N. L. Tewkesbury, assrs to Fram Corpn. A hydrocarbon oil filtering method comprises contacting the oil with a compound formed by reacting an alkylene oxide with the reaction product of a polyalkylene polyamine and a fatty acid glyceride, and collecting on a filtering medium oil contaminant which has been contacted with the compound.

U.S.P. 2,610,209 (24.2.50; 9.9.52). E. M. Honeycutt, assr to Sun Oil Co. In the purification of naphthenic acids by solvent extraction in a countercurrent extraction zone comprising an extract-enriching section at one end and a raffinate-enriching section at the other, the method which comprises feeding crude naphthenic acids containing hydrocarbon oil in heated condition to said zone intermediate said sections, feeding into the raffinate-enriching end a heated solvent selective for naphthenic acids but incompletely miscible therewith and composed mainly of a water miscible polar organic liquid, flowing the solvent through said raffinate-enriching section countercurrent to the feed, and thence through said extract-enriching section, withdrawing from the raffinate-enriching section a raffinate phase rich in hydrocarbon oil, cooling the solvent phase flowing in said extract-enriching section to precipitate a portion of the contained extract, said precipitated extract flowing countercurrent to the solvent as reflux for the extract-enriching operation, and withdrawing solvent phase from the extract-enriching section of said zone.

U.S.P. 2,610,703 (8.7.46; 16.9.52). L. W. Pollock, assr to Phillips Petroleum Co. A process for the separation of a mixture of low-boiling hydrocarbon gases in which the gas mixture contacts a gravitating elongated column of granular activated charcoal.

U.S.P. 2,610,704 (3.7.47; 16.9.52). J. A. Patterson, assr to Standard Oil Development Co. A process for separating ethylene and ethane from a gaseous mixture containing hydrogen, methane, ethylene, and ethane, by extractive distillation at a pressure of 200 to 300 p.s.i. in the presence of acetone or furfural or water solutions thereof.

U.S.P. 2,610,942 (31.3.48; 16.9.52). C. L. Read, assr to Standard Oil Development Co. When treating petroleum oil with a liquid solvent having a preferential selectivity for the more aromatic constituents thereof, introducing into the treating zone 0·0001% to 0·03% by volume of a silicone polymer oil.

U.S.P. 2,610,943 (16.9.47; 16.9.52). E. W. Clarke, assr to Atlantic Refining Co. Wax containing mixtures are separated by countercurrent contact with phenol and furfural at a temp to form two immiscible phases, one containing higher melting waxes and the other containing lower melting waxes, phenol and furfural being introduced into the extraction zone at points related to the original mixture feed point and the high- and low-melting-point wax withdrawal points.

U.S.P. 2,610,977 (6.12.47; 16.9.52). S. G. Gallo, assr to Standard Oil Development Co. Preferentially oil soluble hydrocarbons are separated from a solution thereof in hydrocarbons by treatment with an aqueous aliphatic alcohol solvent, followed by phase separation and contacting the extract phase with a low boiling hydrocarbon.

U.S.P. 2,611,735 (21.6.47; 23.9.52). E. A. Coons, assr to Sinclair Refining Co. Metal compounds are removed from crude oils by a fluorosulphonic acid treatment which causes metal fluorosulphonates to be formed; these fluorosulphonates are finally separated from the oil.

U.S.P. 2,612,464 (22.12.59; 30.9.52). J. G. Giachetto, D. H. Wagner, and J. E. Wolf, assrs to Standard Oil Co. In a process for treating a hydrocarbon charging stock boiling substantially above the boiling range of gasoline, containing sulphur compounds and water, with liquid HF to produce a solution of H_2O, H_2S, and other sulphur compounds in liquid HF and an HF immiscible purified charging stock, a series of steps for treating the solution to isolate therefrom HF which is recycled to the process. D. A. R.

Ger.P. 852,849, 14.8.52. L. Mannes, assr to Henkel & Cie. Process for purification of carboxylic acid mixtures.

BrennstChemie, 1952, **33** (17–18). R. T.

Special Processes

784. Kinetic factors in the rational behaviour of catalytic reactions. J. C. Balaceanu and J. C. Jungers. *Proc. Third World Petrol. Congr.*, 1951, **5**, 67–78.—A study of the practical importance of reactivity, the manner and intensity of the adsorption of the bodies involved in catalytic reactions, and of the solvents is given. 15 refs. E. S. L.

785. A study of the comparative behaviour of alcohols and thiols in heterogeneous catalysis. G. E. Limido and J. C. Jungers. *Proc. Third World Petrol. Congr.*, 1951, **5**, 59–66.—The synthesis and decomposition of ethyl mercaptan on alumina are incomplete reactions. Thermodynamics being insufficient to show this, adsorption coeffs were studied, the indication being that they increased in the order

$$\begin{cases} H_2S, \\ C_2H_5 \end{cases} C_2H_5SH, (C_2H_5)_2S.$$

Thoria is a more reactive cat, but the ratio of adsorption coeffs is unfavourable to the synthesis of mercaptan. Ethanol decomposition takes place by poly decondensation. The difference between sulphuretted and oxygenated compounds is discussed in the light of energetic and kinetic data of the reactions. Kinetic characteristics of cat are important for the determination of the best operating conditions. E. S. L.

786. Pyrolysis of ethene oxide-dehydrogenation into cetane. G. E. Limido, H. Springer, H. Levi, L. Valla, and G. Hugel. *Proc. Third World Petrol. Congr.*, 1951, **5**, 40–8. (In French.)—The decomposition of ethene oxide has been studied as a function of the partial pressure of the ethene oxide under dynamic working conditions during very short contact periods in the 550° to 750° C temp range. Results that two simultaneous reactions take place first: isomerization of ethene oxide into acetaldehyde, and dehydrogenation into cetene. Thermodynamical calculations confirm the possibilities of these two reactions. The activating energy and the rate of dehydrogenation into cetene have been found to amount to 48,000 cal, rate 1. The reaction mechanism is discussed using our basic knowledge of the pyrolysis of acetaldehyde and of propene oxide. (Authors' Abstract.) E. S. L.

787. A new chemical industry based on allyl chloride. D. L. Yabroff and J. Anderson. *Proc. Third World Petrol. Congr.*, 1951, **5**, 22–30.—Shell Chemical Corpn is manufacturing commercially allyl chloride, D–D mixture (dichloropropane–dichloropropenes mixture), allyl alcohol, synthetic glycerine, epichlorohydrin, diallyl phthalate, and EPON resins (epichlorohydrin-polyol condensates). They are the basis of a fast growing industry based on these and other allyl compounds and derivatives. Pro-

duction of the basic intermediate allyl chloride by the high temp chlorination of propylene and its conversion into allyl chloride and glycerine are described. A flow diagram of a commercial allyl chloride plant is given. Some of the reactions and application of these and other allylic compounds and derivatives are described. 33 refs.

E. S. L.

788. Thiophene from hydrocarbons and hydrogen sulphide. R. F. McCleary, L. E. Ruidisch, J. T. Clarke, L. W. Devaney, C. H. Culnane, and R. E. Conary. *Proc. Third World Petrol. Congr.*, 1951, **5**, 49–58.—Thiophene may be prepared from hydrocarbons and H_2S using a variety of cat. Production is greatest from the normal C_4 hydrocarbons, especially olefine, with more than 4 C atoms in a straight chain alkyl thiophenes also formed. As the reaction is only mildly endothermic, a fixed bed reactor is suitable, and as the preferred cat can be regenerated by air, a highly exothermic reaction, a fluidized bed is advantageous. Both methods are discussed with the effect of using various hydrocarbons, and of varying space vel, hydrocarbon/cat wt ratio, temp and pressure being indicated. Diagrams of the reactor systems are given. 10 refs. E. S. L.

789. Use of olefins from petroleum in the synthesis of organic acids and their derivatives. G. Natta, P. Pino, and R. Ercoli. *Proc. Third World Petrol. Congr.*, 1951, **5**, 1–7.—Study of the reactions between olefins, CO, and alcohols enables the determination of the conditions in which the formation of esters of acids with one more C atom than the olefin, or products due to parallel reaction, prevail. Olefins higher than ethylene, and primary alcohols give esters predominant; with asymmetric olefins mixed esters result, and with alcohols higher than methanol the secondary reaction (OXO-synthesis) increases, it being kinetically faster than the carboxylation reaction; with secondary alcohols the OXO-synthesis prevails also in the absence of hydrogen. If the reaction occurs in the presence of hydrogen the OXO-synthesis gives, predominantly, alcohols with one C atom more than the original olefin; the starting alcohol is dehydrogenated less than corresponds to the H_2 absorbed in the alcohol hydrogenation of the aldehyde obtained by OXO-synthesis. In the absence of hydrogen with insufficient CO with respect to the olefin (n, C atoms) the synthesis may, in certain cases, give ketones with $2n + 1$ C atoms predominant. The reaction of olefin, CO, and amines gives amides, and is kinetically faster than carboxylation with CO and ester alcohols. Conditions and yields are given of reactions which substantiate the above remarks. 9 refs.

E. S. L.

790. The OXO process. Research development and product application. H. Hoog. *Proc. Third World Petrol Congr.*, 1951, **5**, 8–21.—The structure of formylation alcohols is discussed, together with the kinetics and mechanism of the OXO process and the cat used and the role of cat carrier. The two main operating techniques under development in Germany (the cat slurry process and the fixed bed soluble cobalt operation) are described and compared and batch operating mentioned. Simplified flow diagrams are given of all three, and summarized results of pilot plant runs given for the continuous processes. Evaluations of OXO-alcohol phthalates as plasticizers for PVC and OXO-alcohol esters as non-hydrocarbon oils are listed. In general, the OXO-process appears very versatile as a source of oxygenated compounds. E. S. L.

791. A comparison of the fixed-bed, liquid-phase (" slurry "), and fluidized-bed techniques in the Fischer–Tropsch synthesis. C. C. Hall, D. Gall, and S. L. Smith. *J. Inst. Petrol.*, 1952, **38**, 845–66.—The three types of apparatus employed are described briefly. The comparison had to be carried out within the range of conditions in which the fluid-bed process is operable. It was found that under similar conditions in each process a particular catalyst gave essentially similar results in fixed-bed, liquid-phase, or fluidized-bed systems. The max activity of the catalyst can only be realized in fluidized-bed systems, but max selectivity is obtained in the slurry process, which has the additional advantage that mechanically robust catalysts are not required.

Indications were found that the activity of the catalyst increases with its degree of dispersion throughout the reaction zone. A. R. W. B.

792. Synthetic liquid fuels. Annual report of the Secretary of the Interior for 1951. Pt. 1—Oil from coal. *Rep. Invest. U.S. Bur. Min. No.* 4865, July 1952, pp. 79.—An account is given of the research and development work carried out in 1951 at : (1) the coal-to-oil demonstration plants, Louisiana, Pa. ; (2) the coal-to-oil laboratories and pilot plants, Bruceton and Pittsburg, Pa. ; (3) synthesis-gas laboratories and pilot plants, Morgantown, W. Va. Noteworthy in the extensive information reported are : the results of liquid- and vapour-phase runs in the coal-hydrogenation plant, and the evaluation of the products—motor and aviation gasoline and jet fuels—are reported ; the development of a new gas-synthesis process, which has passed *via* a small-scale unit, of 1 b.d., to a 50-b.d. plant, and gave in a single pass operation (with a throughput six times greater than that attained in German reactors), 75 to 85% liquid products, containing substantial quantities of gasoline and diesel fuels ; a 500-lb/hr pulverized-coal gasifier, designed to operate at 450 p.s.i., has had a successful preliminary run at 100 p.s.i. Some details are given of the underground gasification project at Gorgas, Ala. W. H. C.

793. High-pressure hydrogenation and Fischer–Tropsch synthesis. F. Schmeling. *Erdöl u. Kohle*, 1952, **5**, 809–12.—Max gasoline output of twelve German hydrogenation plants during war was 4 million tons/year and of nine synthesis plants 600,000 tons. Four hydrogenation and six synthesis plants are in Western Germany, and are being reconstructed ; hydrogenation plants will operate on pet, and are scheduled for 1·2 million tons/year in 1954, whilst synthesis plants, working on coal, will have capacity of 360,000 tons. Latter will concentrate on chemicals, with only 130,000 tons automotive fuel production. Hydrogenation and synthesis plants in Eastern Germany have capacity of 1·3 million tons. Chemical basis of both types of process is outlined ; $C + O_2 \longrightarrow CO$, which reacts with H_2O over Fe cat at 500° C to yield H_2, latter is either used for hydroforming or else reacted with half its vol of CO for synthesis process. Hydrogenation of pet will be both direct and by hydroforming. F–T synthesis produces more water than hydrocarbons, development thereof is Kölbel process, reaction of H_2O and CO, latter is hence only prepared raw material required and can be obtained from numerous sources, *e.g.*, coke-ovens. Gas production for F–T process represents 60% of cost ; H_2 is made in Winkler generator, 70,000 m³/hr of 97% purity, operating temp 900° C, thermal efficiency 80%. Flow diagrams are given for high-pressure (800 atm) hydrogenation of crude and medium-pressure (10 to 30 atm) F–T synthesis, which yields 60 to 70 O.N. gasoline. Further processing of F–T hydrocarbons to wide variety of products (high m.p. waxes, detergents, plasticizers, etc.) is outlined. V. B.

794. Review of 25 years research on the Fischer–Tropsch synthesis and related procedures with special consideration of the relevant reaction mechanisms. H. Pichler. *BrennstChemie*, 1952, **33** (17–18), 289–96. (*Lecture, mtg Catalyst's Club, Philadelphia, March* 15, 1952, *at Wilmington, Delaware.*)—Brief review of research progress with a sketch of the relationship of the main reactions concerned in the different CO hydrogenation processes. **44** refs. R. T.

795. Methane : H_2 + CO. G. Acone. *Riv. Combust.*, **6** (11), 697–707.—Conversion of methane to hydrogen and carbon monoxide is discussed, and results are reported of some experiments carried out both on pilot plant and on commercial scale.

Different types of processes suitable for methane conversion are reviewed, namely the steam, carbon dioxide, and oxygen processes. The effects of the presence in the charge stock of higher hydrocarbons, sulphur compounds, and contaminant gases are also examined in detail.

796. Patents. U.S.P. 2,606,104 (12.4.48 ; 5.8.52). J. P. Hogan and R. L. Banks, assrs to Phillips Petroleum Co. Apparatus for synthesis of hydrocarbons from hydrogen and carbon monoxide using a fluidized reduced iron oxide catalyst.

U.S.P. 2,606,145 (15.5.48 ; 5.8.52). G. D. Creelman, assr to Pittsburgh Consolidation Coal Co. Treatment of carbonaceous solids in fluidized form.

U.S.P. 2,606,158 (4.1.49 ; 5.8.52). S. G. Stewart, assr to Phillips Petroleum Co. Synthesis gas is made by partially oxidizing a C_1 to C_4 paraffin at 2000° to 2500° F

for a time of 0·02 to 2 sec, rapidly quenching the product to 1200° to 1600° F by indirect heat exchange with a cracking stock, which is thereby thermally cracked, and further rapidly cooling the partial oxidation product to below 900° F. A hydrogen and methane fraction from the thermal cracking is passed to the partial oxidation stage.

U.S.P. 2,606,159 (30.10.50; 5.8.52). J. R. Owen, assr to Phillips Petroleum Co. Pelleted alumina–metal oxide catalysts are made by mixing alumina with a combustible binder, forming the mixture into pellets, removing 15 to 85% of the binder by combustion to form a porous shell surrounding an impervious core, impregnating with an aqueous solution of a salt of the desired metal, and calcining to convert the salt to the oxide and burn out the remaining binder.

U.S.P. 2,606,160 (20.3.48; 5.8.52). R. L. Heider, assr to Monsanto Chemical Co. Catalyst for the oxidation of ethylene to ethylene oxide comprises 5 to 25% by wt of silver or silver oxide deposited on a carrier of fused beryllium oxide.

U.S.P. 2,606,819 (10.6.47; 12.8.52). G. F. Friauf, assr to Godfrey L. Cabot Inc. Furnace for producing carbon black.

U.S.P. 2,606,826 (27.3.48; 12.8.52). L. Jacolev and L. P. Gaucher, assrs to Texas Co. Conversion of hydrocarbonaceous material into synthesis gas.

U.S.P. 2,606,827 (21.5.48; 12.8.52). C. B. Glover, assr to United Engineers and Constructors Inc. Production of low nitrogen content water gas.

U.S.P. 2,606,828 (13.11.47; 12.8.52). G. L. Eaton, assr to United Engineers and Constructors Inc. Method and apparatus for manufacturing water gas carburetted with a hydrocarbon oil.

U.S.P. 2,606,867 (16.9.48; 12.8.52). J. A. Pianfetti and R. W. Timmerman, assrs to Food Machinery and Chemical Corpn. Gaseous phase halogenation of hydrocarbons effected by photochemical catalysis in a first stage and a solid catalyst in a second stage.

U.S.P. 2,606,868 (31.5.51; 12.8.52). F. N. Alquist and K. C. Kauer, assr to Dow Chemical Co. An isomeric mixture of benzene hexachlorides containing over 17% of the delta isomer is made by the photo-chlorination of benzene at 0° to −30° C in a chlorinated ethane or methane in the presence of benzothiazole or mercaptobenzothiazole.

U.S.P. 2,606,932 (31.7.50; 12.8.52). R. M. Cole, C. L. Dunn, and G. J. Pierotti, assrs to Shell Development Co. Acrolein is produced by oxidizing propylene, contacting the reaction mixture with liquefied propylene, stripping the propylene from the liquid phase obtained to obtain the acrolein, and passing the gaseous propylene to the reaction zone.

U.S.P. 2,606,933 (31.7.50; 12.8.52). R. M. Cole, C. L. Dunn, and G. J. Pierotti, assrs to Shell Development Co. Methacrolein is produced by oxidizing *iso*butylene, contacting the reaction mixture with liquefied *iso*butylene, stripping the *iso*butylene from the liquid phase obtained, extracting the residue with water flowing countercurrent to liquefied *iso*butylene, stripping the *iso*butylene from the raffinate to obtain the methacrolein, and passing the gaseous *iso*butylene to the reaction zone.

U.S.P. 2,606,936 (29.11.50; 12.8.52). V. F. Michael, assr to Wood River Oil & Refining Co. A mixture containing phenols contaminated with thiophenols, mercaptans and other sulphur compounds, and hydrocarbons is purified by esterification with boric acid, distillation of the contaminants, and hydrolysis of the residual boric acid ester of the phenols.

U.S.P. 2,606,939 (25.6.49; 12.8.52). B. L. Evering and E. F. Peters, assrs to Standard Oil Co. Hydrocarbons are made by contacting an olefin and 5 to 40 vol % of a mixture of hydrogen and carbon monoxide in a mol ratio between 0·5 and 10, with an alkali-promoted iron catalyst at 350° to 425° C and a pressure of 250 to 150 p.s.i.g.

U.S.P. 2,607,482 (9.4.51; 19.8.52). P. B. Weisz, assr to Socony-Vacuum Oil Co. Partially dried spherical particles of inorganic gel, some of which have been completely shrunk and some of which are unshrunken, are separated by dropping them

from a pre-determined height on to an inclined base of sufficient hardness to cause the particles to rebound and collecting the particles of lesser trajectory in one vessel and those of greater trajectory in a second vessel.

U.S.P. 2,607,666 (28.9.46; 19.8.52). H. Z. Martin, assr to Standard Oil Development Co. Treatment of carbonaceous solids.

U.S.P. 2,607,668 (12.8.47; 19.8.52). E. S. Corner, R. V. J. McGee, and C. S. Lynch, assrs to Standard Oil Development Co. Gaseous hydrocarbons are contacted at at least 1600° F with an oxygen carrier consisting of a major proportion of titania and a minor proportion of iron, nickel, cobalt, manganese, chromium, or tungsten oxide, to produce industrial gases containing carbon monoxide and hydrogen.

U.S.P. 2,607,669 (12.8.47; 19.8.52). E. S. Corner and C. S. Lynch, assrs to Standard Oil Development Co. As U.S.P. 2,607,668, except that the oxygen carrier is a mixture of iron and manganese oxides.

U.S.P. 2,607,670 (15.8.47; 19.8.52). W. K. Lewis, assr to Standard Oil Development Co. Gaseous fuel containing carbon monoxide and hydrogen is made by forcing a hydrocarbon gas through a fluidized mass of finely divided metal oxide at 1400° to 1600° F at such a rate as to attain only partial conversion and passing the gases with entrained metal oxide fines through a second zone at 2000° to 2500° F, in which zone the gases are contacted with oxygen and the metal oxide fines are sintered and agglomerated.

U.S.P. 2,607,671 (Netherlands 1.11.45; 19.8.52). W. J. van Heeckeren, G. J. H. Vermeer, and J. L. Baartman, assrs to Hartford National Bank and Trust Co. Method of generating combustible gas from liquid hydrocarbons.

U.S.P. 2,607,787 (1.8.50; 19.8.52). R. B. Mason, assr to Standard Oil Development Co. Branched chain fatty acids are made by reacting a mixture of OXO alcohols derived from C_8–C_{16} olefins, with some previously formed fatty acids to form a mixture of esters, carboxylating the esters with carbon monoxide in the presence of a metallic carbonyl to produce acid anhydrides, and hydrolysing the anhydrides.

U.S.P. 2,607,800 (14.12.49; 19.8.52). E. Arundale, assr to Standard Oil Development Co. Organic chloroesters are made by reacting a 4-alkyl meta-dioxane with an organic acid chloride in the presence of zinc chloride.

U.S.P. 2,608,526 (14.12.46; 26.8.52). W. A. Rex, assr to Standard Oil Development Co. Coking of carbonaceous fuels by a method involving passing carbonizable material along a narrow path in contact with finely divided solids fluidized by an upwardly flowing gas.

U.S.P. 2,608,535 (9.5.47; 26.8.52). B. G. Gillespie, assr to Standard Oil Development Co. Catalyst for the Fischer–Tropsch process consists of sintered iron obtained by the reduction of iron oxide mixed with 2 to 10 wt % of finely divided carbon and <10 wt % of an alkali metal compound promoter.

U.S.P. 2,608,568 (12.4.48; 26.8.52). J. P. Hogan and A. H. Friedman, assrs to Phillips Petroleum Co. Regeneration of catalyst used in the Fischer–Tropsch process.

U.S.P. 2,608,569 (22.8.46; 26.8.52). C. E. Hemminger, assr to Standard Oil Development Co. Removal of carbon from fluidized catalyst used in the Fischer–Tropsch process.

U.S.P. 2,608,585 (15.6.48; 26.8.52). K. D. Detling and T. Skei, assrs to Shell Development Co. Reactivation of cuprous oxide catalysts used in the oxidation of olefins.

U.S.P. 2,608,590 (2.12.48; 26.8.52). H. F. Johnson and H. W. Scheeline, assrs to Standard Oil Development Co. Xylene is brominated by contacting a gaseous stream of bromine, air, and xylene with a catalyst comprising $CuBr_2$, ThO_2, and CeO_2 at 300° to 600° F, washing the product with caustic, fractionating to isolate the monobromoxylene, and recycling unreacted xylene. The ratio of xylene to bromine in the reaction mixture is described.

U.S.P. 2,608,593 (13.8.46; 26.8.52). R. D. Fowler and H. C. Anderson, assrs to the U.S.A. as represented by the U.S. Atomic Energy Commission. Perfluorination of hydrocarbons using cerium tetrafluoride at 100° to 450° C. J. M. S.

U.S.P. 2,609,345 (14.7.49; 2.9.52). J. C. Easly and H. C. Kellner, assrs to Gulf Research and Development Co. Fixed bed Fischer–Tropsch catalyst is regenerated by burning off carbonaceous deposits by supplying to the catalyst inlet gas at 650° to 850° F, and controlling flow rate and oxygen content of gas so that max temp of cat does not exceed inlet gas temp by more than 300° F.

U.S.P. 2,609,382 (31.12.48; 2.9.52). B. J. Mayland, assr to Phillips Petroleum Co. In preparing a feed gas for a Fischer–Tropsch synthesis or for an OXO cat synthesis, natural gas is partially oxidized and then subjected to diffusion to vary the hydrogen content.

U.S.P. 2,609,395 (16.12.49; 2.9.52). C. F. Dougherty and C. C. Chapman, assrs to Phillips Petroleum Co. A *cyclo*alkanol and a *cyclo*alkanone are produced by reacting a *cyclo*alkano hydroperoxide with a stoichiometric excess of a *cyclo*alkane at 160° to 260° C, 50 to 1000 p.s.i. and a reaction time of 10 to 200 min.

U.S.P. 2,609,400 (5.4.50; 2.9.52). E. H. Amick, assr to Standard Oil Development Co. *iso*Propanol is produced by hydrating propylene with sulphuric acid of 60 to 70% weight concentration under specified conditions.

U.S.P. 2,610,200 (15.6.46; 9.9.52). A. Clark, assr to Phillips Petroleum Co. In hydrocarbon synthesis by contacting a gaseous mixture of carbon monoxide and hydrogen with a cobalt cat, carbon monoxide is added to the residual gas to give a feed gas proportion of carbon monoxide, and the resulting mixture is passed to a conversion zone.

U.S.P. 2,610,211 (4.10.47; 9.9.52). J. L. Darragh, assr to California Research Corpn. Benzene monocarboxylic acids are prepared by intimately contacting a mixture of a monochloromethyl benzene, containing not more than two chlorine atoms in the chloromethyl group, and aqueous sodium hydroxide, with a free oxygen containing gas (the oxygen being equivalent to the monochloro-methylbenzene) at a temp of 300° to 400° C.

U.S.P. 2,610,981 (28.8.47; 16.9.52). G. H. Short, assr to Phillips Petroleum Co. Thiols and thioethers are made by contacting at 100° to 400° F an olefinic hydrocarbon having at least 8 carbon atoms per mol with a molar excess of H_2S or an alkyl mercaptan in the presence of acid activated montmorillionite having a specified alumina : magnesia ratio.

U.S.P. 2,611,788 (18.2.48; 23.9.52). H. S. Block, assr to Universal Oil Products Co. A process for modifying a drying oil containing polyolefinic, cyclic hydrocarbons having conjugated and non-conjugated unsaturation, which comprises reacting the drying oil with an aliphatic mono-olefinic hydrocarbon at a temp from 50° to 300° C.

U.S.P. 2,612,477 (27.3.46; 30.9.52). R. G. Mitchell, H. C. Tait, W. C. Webber, R. G. Aickin, P. A. Winsor, and A. V. Billinghame, assrs to Shell Development Co. An emulsifier composition consisting essentially of a hydrophilic water-soluble polar inorganic salt of an organic acid containing a $-SO_3H$ group and having a C_8 to C_{20} alkyl chain together with an amine alicyclic compound free from alcoholic hydroxy groups, water, and an organic liquid incompletely miscible therewith, the amine amounting to 5 to 100% of the weight of the inorganic salt, the water to 2 to 95% and the organic liquid 1·5 to 9% of the total weight of the mixture.

U.S.P. 2,612,515 (22.10.49; 30.9.52). B. E. Hudson, H. L. Wilson, and J. F. Nelson, assr to Standard Oil Development Co. Colour formation during the esterification of maleic, adipic, or phthalic acid with a C_{4-12} monohydric OXO alkanol having sulphur impurities is inhibited by operating in the presence of a small amount of an organic, phosphite ester. D. A. R.

Ger.P. 854,202, 28.8.52. H. Neweling, assr to Ruhrchemie A.G. Process and device for temp regulation in conversion of CO and H_2 gas mixtures.

Ger.P. 852,840, 14.8.52. H. Bähr, assr to Bad. Anilin- & Soda-Fabr. Method for processing H_2S or gases containing H_2S to S or H_2SO_4.

Ger.P. 854,204, 28.8.52. W. Linder, assr to H. Koppers G.m.b.H. Process for recovering S from coke plant or similar gases.

Ger.P. 852,989, 21.8.52. M. Pier, W. Oettinger, and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Process for dehydrogenation of naphthenic hydrocarbons.

Ger.P. 852,850, 14.8.52. K. Weichert and K. Haberl, assrs to Chem. Werke Hüls G.m.b.H. Method for production of unsaturated hydrocarbons.

Ger.P. 852,732, 14.8.52. K. Behringer, assr to Bad. Anilin- & Soda-Fabr. Process for colouring hydrocarbons and waxes.

Ger.P. 852,846, 14.8.52. F. Siegmann, assr to Deutsche Gold & Silber Scheideanstalt. Method for producing highly activated $Al(OH)_3$.

Ger.P. 853,440, 21.8.52. H. Wiedmann, assr to Steinkohlenbergwerk Rheinpreussen. Method for producing especially fine-grained, homogeneous $Al(OH)_3$.

Ger.P. 854,216, 28.8.52. K. Büchner and P. J. Kühnel, assrs to Ruhrchemie A.G. Process for cat water gas addition to unsaturated hydrocarbons.

Ger.P. 853,586, 21.8.52. E. Grossmann. Device for evacuating liq from containers under a vac.

BrennstChemie, 1952, **33** (17–18). R. T.

Metering and Control

797. Patents. U.S.P. 2,605,638 (13.4.46; 5.8.52). J. M. Pearson, assr to Sun Oil Co. Flowmeter.

U.S.P. 2,605,640 (8.10.49; 5.8.52). J. G. Partch, D. R. Day, and W. E. Scovill, assrs to Standard Oil Co. Cleanable sight glass for gauges.

U.S.P. 2,606,297 (24.8.50; 5.8.52). M. H. Sweet, assr to General Aniline & Film Corpn. Photo-electrically actuated device for controlling liquid supply to a container.

U.S.P. 2,607,223 (28.8.47; 19.8.52). J. G. Fleming, assr to Bristol Co. Apparatus for measuring rate of flow of an electrically conducting fluid stream.

U.S.P. 2,607,225–7 (23.1.48; 10.3.48, 17.7.47; 19.8.52). P. H. Biscoe, assr to Saf-T-Visi Gauge Corpn. Liquid level gauges.

U.S.P. 2,607,229 (30.12.49; 19.8.52). H. A. Quist, assr to Sun Oil Co. Liquid sampling device.

U.S.P. 2,607,718 (17.6.46; 19.8.52). J. G. Suthard, assr to Petrolite Corpn. Method and apparatus for controlling the amount of a reagent continuously delivered to an oil stream.

U.S.P. 2,608,477 (3.11.47; 26.8.52). D. W. Schaeffer, assr to Phillips Petroleum Co. Automatic control of inspirators for gas plants.

U.S.P. 2,608,527 (1.8.47; 26.8.52). W. W. Holland, assr to Gyro Process Co. Temp control method in the shock-chilling of products from vapour phase hydrocarbon conversion. J. M. S.

Products

Chemistry and Physics

798. A general study and presentation of the analyses of combustion products. R. Pigrais and M. Brunet. *Proc. Third World Petrol. Congr.*, 1951, **7**, 22–59. (In French.) —The paper contains information of the general study and presentation of the analysis of combustion products. The first part consists of tables of conventions and symbols. The second is devoted to the combustion equation and to the expressions for excess or shortage of air, and the general case of combustion is given involving any number of unburnt products $C^mO^pH^n$ extended to include carbon in the form of soot. In the third section a critical examination is given of certain combustion diagrams, *i.e.*, certain methods of representing graphically the equations and expressions developed in the paper. Finally, an indication is given to the importance and significance of all these diagrams. E. S. L.

799. Combustion studies at the research laboratory of the Institut Français du Pétrole. H. Guenoche, F. Ferrie, and N. Manson. *Proc. Third World Petrol Congr.*, 1951, **7**, 7–21.—Work has been undertaken to clarify: (1) the kinetic and reaction combustion mechanism, and (2) the mechanism of flame propagation. The kinetic and reaction combustion mechanism were studied using common methods of kinetic chemistry. By recording variations in pressure with time it was concluded that the "peninsula of explosion" did not exist, for instead of a combustion curve they obtained: (1) an initial curve separating the region of normal flame from those of slow oxidation, and (2) a second curve delimiting a region adjacent to the preceding one at high temp and low pressures. A spectrographic method has been used to study the mechanism of combustion reactions. Stationary flames have been studied by optical methods. A theoretical investigation was carried out on the speed of flame propagation, with special interest on the effects of inert gases and the propagation of flames in ducts. Photographs, diagrams, and results are included. E. S. L.

800. Problems of hydrocarbon combustion. W. Jost. *Proc. Third World Petrol. Congr.*, 1951, **7**, 1.—The reaction in hydrocarbon mixtures leading to ignition is investigated. There are two well defined induction periods. The first, which is a reaction similar to that occurring in cool flames, is described as an adiabatic explosion due to degenerate chain branching. This, probably, holds for the second stage, too, though definite proof is still lacking. The apparent energies of activation observed in ignition experiments cannot represent time energies of activation, and consequently are not comparable with the energy of activation responsible for the propagation of cool flames. For constant thermal conductivity, the ignition energy is lowest for the maximum value of the flame speed. Therefore, as a rough approximation, the minimum ignition energy as a function of composition should coincide with the maximum burning velocity. For saturated hydrocarbons the primary chain-propagation process consists in a reaction of active particles with hydrogen atoms of the hydrocarbon, involving a considerable energy of activation. With unsaturated hydrocarbons the primary steps may be a reaction of active particles with carbon at the double bond, involving a lower energy of activation. E. S. L.

801. Determination of the molecular weights of low-vapour pressure oils. G. Burrows and R. Jackson. *Vacuum*, Jan. 1952, **11**, 50–5.—The mol wt of diethyl-hexyl phthalate and diethyl-hexyl sebacate has been determined by the cryoscopic method, after purification by mol dist. The results obtained varied only a few per cent from the theoretical values. Data are given of the experimentally determined mol wts of various low-vapour-pressure oils and greases. W. H. C.

802. Conversion of hydrocarbons to carbon monoxide–hydrogen mixtures. K. Peters and E. Kappelmacher. *BrennstChemie*, 1952, **33** (17–18), 296–307. (*Inst. for Process Technique and Fuel Technology, Techn. High School, Vienna.*)—An investigation to obtain by thermodynamic calculations and experimental results, a reliable basis for cracked gas production from pet for mixing with town gas, suitable CO–H_2 mixtures for research and to clarify thermodynamics and kinetics of these reactions. The theoretical cracked gas composition is determined accurately by calculation for CH_4 cracking with air, steam, and CO_2 for the whole technically interesting temp range and for the theoretically important CO–N_2 mixtures. Laboratory experiments performed in the apparatus reproduced, with a series of Ni cat, Al_2O_3 accelerator, and various supporters confirm calc values. Cat CH_4 cracking with air or O_2 proceeds much quicker than with CO_2 and steam at the same temp. Reaction mechanism is discussed in relation to results. Soot formation is prevented by the indicated changes in operating conditions. Diagrams and tabulations of results indicate operating conditions for hydrocarbon cracking with steam, CO_2, O_2, and air, and their mixtures for every desired cracked gas composition. The thermodynamic final condition is independent of material type but dependent on atomic ratio C : H : O : N and temp. The results, therefore, can be utilized on gasification or cracking of any solid, liq, or gaseous fuel with air, O_2, steam, and CO_2 as gasifying agents. R. T.

803. Viscosity–temperature relationships of lubricating oils. J. Fessler. *Erdöl u. Kohle*, 1952, **5**, 718–23.—Modern tendency to use low-visc lubes makes visc–temp

relationship of low-visc oils of especial importance. Existing expressions are reviewed, and it is pointed out that Walther's formula (cf. Abs. 557 of 1936) can no longer be considered applicable to low visc and high temp. The expression $ar\ sh\ \ln\ \eta/\eta_{10} = B - k \ln T$, based on work of Umstätter (*Kolloidszczr.*, 1940, **90,** 172), is proposed, and results on a number of oils are plotted by means of this expression and also that of Walther. The vertex ("Scheitelpunkt") of the visc–temp curve of oils plotted according to the Umstätter formula always occurs at the same value of dv/dt cs/° C, ($-0{\cdot}827$). The vertices of visc–temp curves of varying steepness lie on a straight line. A nomogram is given for determining the position of such vertices for curves of steepness (k in Umstätter's expression) varying from 2 to 6. Knowledge of the position of the vertex indicates in which portion of the visc–temp curve the lubricating function under investigation is occurring, the further to the right of the vertex the operating region, the less influence there is on the viscosity by a change in temp. Depending upon the steepness of the visc–temp curve, the region of relatively little change of visc with temp will commence at a higher or lower temp. Any one position of the vertex can only correspond to a single visc–temp curve. V. B.

804. Physical state of petroleum, gas, and water under conditions existing in a petroleum deposit. M. A. Kapelyushnikov, T. P. Zhuze, and S. L. Zaks. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk,* 1952, 1700–10.—Laboratory experiments were made using eight different crudes (d 0·800–0·908) at temps in range room temp –70° C. Phase change was detected electrically by measurement of condenser capacity at positions of test vessel differing by 180°, if rotation of vessel produced no change in electrical capacity this indicated the existence of a single phase. Crit pressure (P_{crit}) of system crude–methane was always >500 atm (*ca* 1000 atm), but was lowered by addition of *n*-pentane and lower methane homologues. In triple system crude–*n*-pentane–methane, P_{crit} increased with d of crude. Removal (Si gel) of resinous compounds from crude decreased P_{crit}, values of which were also lower with CO_2 than with CH_4. In system crude–CO_2 addition of N_2 raises P_{crit}. P_{crit} is considerably (up to 42%) lowered (except for very light crudes) by presence of solid phase similar to reservoir material, but if such solid is moistened with water P_{crit} is higher than in dry state. Lowering of P_{crit} by presence of rock material depends upon adsorptive properties of latter. It is suggested that bitumen deposits may be caused not only by adsorption of resins, etc., from crudes and subsequent oxidn but also by conversion of system, asphaltic crude–gas, to a homogeneous phase, with consequent deposition of bitumen. V. B.

805. Surface free-energy of solid paraffin wax. E. B. Greenhill and S. R. McDonald. *Nature, Lond.,* 1953, **171,** 137.—Filaments, *ca* 0·1 mm radius, of paraffin wax were produced by extrusion through a tungsten carbide die, and their lengths were measured at intervals. The length of such a filament tends: (*a*) to increase under its own weight; (*b*) to decrease so that the surface free-energy γ is reduced. The critical length l_0 at which these opposing tendencies are equal was found by interpolation, and γ was calculated from the equation $\gamma = \frac{1}{4}\rho g r l_0$ where ρ is the density of the solid and r the radius of the filament. γ was determined at three temps.

γ was also obtained for liquid paraffin wax at different temps by the ring tensiometer method.

The plot of γ *versus* temp shows a discontinuity in γ when melting occurs, but $d\gamma/dT$ is approx the same for solid and liquid. H. C. E.

806. Rates of combustion of solid fuel particles. G. A. E. Godsave. *Nature, Lond.,* 1953, **171,** 86.—Primary combustion of solid fuel particles occurs at their surface, and the rate-determining process is the rate at which O_2 is transferred through the gas film surrounding the particle.

For carbon spheres in air, assuming that the primary reaction product is CO, it can be shown that the reaction rate at a representative mean gas-film temp of 1200° C may be represented by the equation $F = Sd/\rho D = 0{\cdot}347(1 + 0{\cdot}272R^{\frac{1}{2}})$, where S is the specific reaction rate at the surface of the sphere (g sec^{-1} cm^{-2}) of dia d; ρ is the density of the gas; D is the coeff of diffusion of O_2 in the gas; and R is the Reynolds number.

The factor 0·347 is prop to the partial pressure of O_2 in the free gas stream. At a given R the effect of temp is small. H. C. E.

807. The reaction of dinitrogen tetroxide with olefins. Octadec-1-ene and buta-1 : 3-diene. C. R. Porter and B. Wood. *J. Inst. Petrol.*, 1952, **38**, 877–81.—The liquid phase reactions of these two olefins with dinitrogen tetroxide have been examined, and experimental data are reported. The results obtained support the conclusion that the oxides of nitrogen are not suitable reagents for the general characterization and analysis of olefins. A. R. W. B.

808. Catalytic hydrocondensation of carbon monoxide with olefins. 8. Hydrocondensation of carbon monoxide with *iso*butylene. Ya. T. Eidus, K. V. Puzitzkii, and M. I. Batuev. *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk*, 1952, 978–81. (Cf. Abs. No. 1667 of 1952.)—Equimol mixture of *iso*butylene and H_2, +5 to 6% CO at 190° C, atm pressure, passed over special cat. Product (max yield 785 ml/m³) contained 11% unsats and 5% C_4's. Hydrogenation and subsequent dist (87% to 157° C) indicated presence of C_5, C_6, C_7, and C_8 compounds in respective amounts of 12, 22, 22, and 12%, consisting substantially of 2-methyl-butane, -pentane, -hexane, and -heptane. In addition to b.p., identification was confirmed by Raman spectra. V. B.

Analysis and Testing

809. New laboratory methods for studying the elimination of deposits of lead in motor cylinders. Reactions of various bromo ethanes with lead tetra ethyl, lead oxide, and metallic lead. M. L. Y. Rollin and C. Rouit. *Proc. Third World Petrol. Congr.*, 1951, **7**, 192. (In French.)—The authors describe an original laboratory method, which permits a rapid and inexpensive quantitative study of the action, in the presence or absence of air, of halogen carriers on lead-tetraethyl vapour and on lead deposits or compounds (particularly PbO). The experiments now being pursued were carried out with di-, tri-, and tetra-bromoethanes. The results obtained are described and commented upon. (Authors' Abstract.) E. S. L.

810. Influence of oxygen compounds on the performance of gasolines for automobile and aeroplane engines. M. Brummer. *Proc. Third World Petrol. Congr.*, 1951, **7**, 270. (In French.)—Laboratory tests are outlined for the determination of the tendency of oxygenated compounds to cause vapour lock. Calculations based on the calorific value per litre of mixture are given for determining any change necessary in the jet when either the fuels or the fuel–air ratios are changed. Certain oxygenated compounds, such as ethyl acetate, when used as admixtures to gasoline give rise to condensates having a high content of acetic acid, which acid can corrode engine parts. Conversely, other oxygenated compounds, such as alcohols, paraldehyde, and dimethyl acetal, do not have this effect. E. S. L.

811. Octane number and automotive gasoline engine performance. E. B. Evans, C. H. Sprake, and H. L. West. *Proc. Third World Petrol. Congr.*, 1951, **7**, 210.—The factors affecting the "road O.N." are associated with the fuel and engine characteristics. These are discussed with the available bench and road test methods, and the correlation and limitations. A new test is described which is applicable to normal driving conditions in the U.K. This test can be accurately simulated on the bench. The behaviour of a number of fuel and engine types is discussed. E. S. L.

812. Determination of aromatics. I. W. Mills. *Petrol. Engr, Ref. Annual*, 1952, **24** (8), C51–2.—A method of determining aromatics by adsorption with silica gel is presented which gives rapid determinations with small samples. A 10-g sample of oil in solution with low b.p. solvent is percolated through a column containing silica gel and clay. The column is washed with naphtha, which is then evaporated, leaving the non-aromatic part of the sample, and the aromatics are determined by difference from the original sample. Twelve determinations are possible by one man in 8 hr using a battery of six columns. The accuracy of all determinations on known mixtures was within 1% of the true value. E. K. J.

813. Measurement of viscosity of non-Newtonian liquids. A. G. Epprecht. *Chim. anal.*, 1953, **35**, 3–8.—Flow characteristics of various types of liquids and suspensions are discussed, and numerous examples (paints, etc.) of non-Newtonian flow are illustrated, mainly by means of shear stress/velocity gradient diagrams. V. B.

814. Patents. U.S.P. 2,607,217 (11.10.48; 19.8.52). E. Merten and M. M. Robinson, assrs to Shell Development Co. Viscosity meter.

U.S.P. 2,607,218 (8.9.51; 19.8.52). C. M. Hansen, assr to Research Corpn. Penetrometer.

U.S.P. 2,608,528 (11.3.49; 26.8.52). J. J. Piros and J. A. Glover, assrs to Sinclair Research Laboratories Inc. Laboratory micro-still for fractional distillation of mixtures of liquids. J. M. S.

Gas

815. Application of natural gas and liquid gas in Western Europe. L. A. Peletier. *Proc. Third World Petrol. Congr.*, 1951, **7**, 60–5.—A concise account is given of the applications of natural and liquid gas in Europe. Natural gas is used for town gas, heating in industry, chemical and engine fuels. Liquid gas is utilized in domestic and industrial fields and also for internal combustion engines. Tables are given which include the various consumptions of these gases for their different uses. E. S. L.

816. The development of the natural gas industry in Italy. C. Padovani. *Riv. Combust.*, **6** (11), 667–96.—After a short outline of the earlier discoveries and utilizations of natural gas resources in Italy, the rapid development of Italian natural gas industry is described.

The first utilization, as motor fuel, of methane compressed in cylinders, started in 1935, and reached its maximum during the Second World War, when the country had been cut off from petroleum supplies.

Systematic prospections for gas resources have been carried out in the Po plains by the Government owned Company A.G.I.P., with very satisfactory results.

New utilizations for natural gas are now in industrial and domestic heating, as coal gas substituent, and as a raw material for chemicals.

The author discusses in detail technical and economical problems connected with the different utilizations, pointing at the large benefits coming to Italy by its new and growing industry. (Author's Summary.)

817. Chemical utilization of natural gas. C. Padovani. *Proc. Third World Petrol. Congr.*, 1951, **5**, 138–49. (In French.)—The use of natural gas as the source of the base material for chemical syntheses when the base required is hydrocarbons is discussed. The main processes for their utilization are pyrolysis and incomplete oxidation, and a combination of the two. Others are: reaction with NH_3 and air, chlorination, nitration, sulphuration, etc. The liberation of phosphorus from phosphorites mixed with silica by using the reducing action of the carbon and hydrogen formed during the cracking of methane is considered. E. S. L.

818. Natural-gas production should rise 8%. J. A. Kornfeld. *Oil Gas J.*, 26.1.53, **51** (38), 207.—Total production of natural gas should approach 8·7 trillion cu. ft. in 1952. Tables show growth of marketed production in the U.S. by States, for various years from 1940 to 1952, estimated proved reserves, and estimated recoverable reserves of natural gas. G. A. C.

Engine Fuels

819. Anti-knock agents and fuel additives. G. Roberti and E. Pipparelli. *Proc. Third World Petrol. Congr.*, 1951, **7**, 182–91.—In this paper metallic and non-metallic compounds are examined from the point of view of their properties, differences indicating a different anti-knock mechanism have been duly pointed out. The authors suggest that while nitrogen anti-knock compounds act only in the first phase of

knocking, *i.e.*, during the formation of formaldehyde, organic peroxides, etc., which cause the true knocking effect in the second phase, the metal organic anti-knock compounds act also in the second phase, by interrupting the reaction chains.
E. S. L.

820. Utilization of viscous fuels to help weak burners. A. F. Guillmeric. *Proc. Third World Petrol. Congr.*, 1951, **7**, 76. (In French.)—The paper discusses the tendency in France to use the more viscous fuels in place of the thinner fuels in the industrial and domestic fields. E. S. L.

821. Utilization of heavy combustibles—use of generators with free pistons in rail transport. F. Picard and R. Huber. *Proc. Third World Petrol. Congr.*, 1951, **7**, 130. (In French.)—The gas generator with free pistons, combined with a turbine has now been applied for the first time to a locomotive of 1000 h.p. The authors describe this achievement. The flexibility of the turbine fed by the generator with free pistons permits omitting the gear-box or electrical transmission, which was necessary in the internal combustion engines. It has been estimated that the driving force will probably exceed that of the best diesel engines now used, and the tests seem to indicate that this traction mechanism will be able to consume fuel oil. E. S. L.

822. A contribution to the study of the value of antiknock materials to French vehicles. L. Thaler and R. Guyot. *Proc. Third World Petrol. Congr.*, 1951, **7**, 206. (In French.)—As a result of the experiments made on fuels of various composition conforming to legal specifications concerning their respective road O.N., the French Petroleum Institute have found that high aromatic and ethylenic gasolines would perform on cars better than their O.N. determined by the motor method would seem to indicate. Some fuels having the same motor method O.N. have road O.N. altogether different; these generally vary in the same way as Research O.N. E. S. L.

823. A contribution to the study of the phenomena of knocking. R. Vichnievsky, B. Salé, O. Widmaier, and F. Mauss. *Proc. Third World Petrol. Congr.*, 1951, **7**, 233. (In French.)—The authors have studied knocking combustion from three points of view: from the thermodynamical, chemical, and the practical one in the C.F.R. engine. They showed that it is possible to predict the highest compression ratio when one of the conditions is modified. The oxidation products are in direct relation with the appearance of knocking combustion, but it is possible to have a greater quantity of them without knocking when the mixture is stronger. The duration of the normal combustion preceding knocking is different for fuels of the same O.N. E. S. L.

824. Advances in the utilization of tetraethyl lead. J. B. Macauley. *Proc. Third World Petrol. Congr.*, 1951, **7**, 154–68.—The use of T.E.L. has been increased because: (1) engine efficiency increases with compression ratio; (2) anti-knock values of fuels depend on combustion chamber design; (3) T.E.L. retains its effectiveness in base stocks; (4) T.E.L. is not responsible for the increased anti-knock requirement caused by accumulation of deposits; (5) satisfactory volumetric efficiencies are obtained with post-war engines using compression ratios up to 12 : 1; and (6) the major difficulty in the use of T.E.L., *i.e.*, the decreased durability of exhaust valves, has been overcome by selection of improved value steels and use of sodium cooling and valve rotators.
E. S. L.

825. Lead precipitation in aviation fuels. W. A. Partridge and H. J. Alty. *Proc. Third World Petrol. Congr.*, 1951, **7**, 169–81.—Lead precipitation is particularly apparent in aviation gasolines, which are often stored for long periods. This paper gives data on the effect of sulphur compounds, olefins, and inhibitors. It is concluded that lead precipitation may be avoided by adequate refining treatment and the use of a minimum concentration of potent inhibitors. E. S. L.

826. Sulphur in automotive gasoline—a review of the work of the co-ordinating Record Council (inc. U.S.A.) in regard to the sulphur content of gasoline (for automotive vehicles) and the effect of sulphur on engine operation. E. J. Gay. *Proc. Third World Petrol. Congr.*, 1951, **7**, 261–9.—This paper presents the results of the co-operative

work to investigate the effects of sulphur in the automotive gasoline on engine operation. The field test data reported herein show that the influence of up to 0·3% sulphur in gasoline, as compared to gasolines of 0·1% sulphur and lower, may vary from no effect under continuous operation at normal engine temp to a pronounced effect on cylinder and ring wear under same operating conditions. This increased wear, to a considerable extent, does not check general field service experience in the U.S., even in the areas where high sulphur gasoline has been widely used. E. S. L.

827. Sulphur and ash in fuels. The Swiss Engineering Industry. *Proc. Third World Petrol Congr.*, 1951, **7**, 119–29.—The sulphur and ash content of petroleum products can result in very undesirable corrosions and ash deposits. The influence of the sulphur content is due to: (1) sulphuric acid, sulphur trioxide, and sulphates; and (2) to sulphurous acid, sulphur dioxide, and sulphites. Ash components often cause detrimental non-corrosive or corrosive deposits. The present article refers to the experiences of the Swiss Engineering Industry in this connexion. E. S. L.

828. Petroleum fuels in jet and rocket propulsion. J. M. Carter. *Proc. Third World Petrol. Congr.*, 1951, **5**, 79–86.—In the jet and rocket propulsion field petroleum products will, in the majority of applications, continue to be used as fuel. The physical properties and combustion characteristics (many of which are new and many not understood) required for these fuels are discussed. Some problems encountered in jet and rocket engines are outlined, particularly in the requirements for speed of combustion and for heat transfer, the solution of which will make improvement in performance possible. E. S. L.

829. Aircraft turbine engine fuel requirements. E. A. Droegemueller. *Proc. Third World Petrol. Congr.*, 1951, **7**, 89.—A comparison is given of the suitability of different fuels for use in the aircraft turbine engine. The fuel characteristics discussed are: volatility, fire hazards, low temp characteristics, storage stability, fuel pump lubrication, combustion characteristics, heats of combustion, and fuel availability and costs. The author calls attention to the advantages of the distillate fuel of the kerosine type. The relatively high visc and low volatility of such a fuel confers considerable advantages in relation to the permissible range of turbine powered aircraft. E. S. L.

830. The gas turbine and its fuels. E. L. Bass, I. Lubbock, and C. G. Williams. *Proc. Third World Petrol. Congr.*, 1951, **7**, 99.—The paper discusses the trends and the conclusions which may be drawn from recent studies on the relation between combustion and fuel properties as applied to gas turbines for aircraft, and as power plant for marine, locomotive, and industrial use. In the aero gas turbine field it is becoming evident that wider-range fuels than have hitherto been used may be used in the future. Marine and industrial gas turbines are not yet universally capable of burning satisfactorily the residual type of fuel oil. Progress is being made in an understanding of deposition and the sometimes associated corrosion, and there is good reason to believe that, in time, solutions to these problems will be found. E. S. L.

831. Jet fuels. Anon. *Oil Gas J.*, 5.1.53, **51** (35), 85.—No. 152 in the Refiner's Notebook series tabulates jet fuel specifications and procurement, the latter summarizing the U.S. Bureau of Mines survey, Oct. 1951. G. A. C.

832. Products of combustion from diesel fuel. M. A. Elliott, R. F. Davis, and R. A. Friedel. *Proc. Third World Petrol. Congr.*, 1951, **7**, 280.—The relation between fuel : air ratios and the products of incomplete combustion is discussed, and the probable origin of these products is indicated. The composition of the Diesel exhaust gas depends chiefly on the fuel : air ratio. However, the relation between the fuel : air ratio and the constituents present in low concentration—carbon monoxide, aldehydes, and oxides of nitrogen—is affected to some extent by the type of engine, composition of the atmosphere, barometric pressure, and the cetane number of the fuel. Harmful effects of some products are also indicated. E. S. L.

833. Alcohol motor fuels—production and use. S. J. W. Pleeth. *J. Inst. Petrol.*, 1952, **38**, 805–19.—Commercial processes for producing alcohol are described briefly. The octane no. improvement obtained by blending alcohol into gasoline is pointed out, and other aspects of such blends are discussed. A. R. W. B.

834. Economic aspects of alcohol in motor fuel. T. C. Owtram. *J. Inst. Petrol.*, 1952, **38**, 820–34.—The economic factors affecting the use of alcohol in motor fuels are presented. A study has also been made of the circumstances under which alcohol blends have been marketed on a considerable scale in some countries, and the economic implications of this are discussed. A. R. W. B.

835. Patents. U.S.P. 2,608,476 (26.1.49; 26.8.52). B. R. Strickland, assr to Standard Oil Development Co. A paraffinic base gasoline containing up to 4·6 ml/gal of tetraethyl lead, one to one and a half theories of a halogenated hydrocarbon lead scavenging agent, *N* : *N'*-di-*sec*-butyl-*p*-phenylenediamine (up to 4 lb/5000 gal), and *cyclo*hexylamine (0·05 to 0·2 lb/5000 gal). J. M. S.

Ger.P. 854,211, 28.8.52. H. Bueren, assr to Bad. Anilin- & Soda-Fabr. Method for producing knockproof motor fuels.

Ger.P. 854,346, 28.8.52. H. Nonnenmacher and W. Oettinger, assrs to Bad. Anilin- & Soda-Fabr. Process for recovering gasoline from crude oil or crude oil residues.

Ger.P. 852,696, 14.8.52. G. Speckhardt and G. Stamm, assrs to Gelsenkirchener Bergwerks-A.G. Method for producing coal tar–diesel oils.
BrennstChemie, 1952, **33** (17–18). R. T.

Gas Oil and Fuel Oil

836. The stability and compatibility of fuel oils. C. W. G. Martin. *Proc. Third World Petrol. Congr.*, 1951, **7**, 66–75.—The paper reviews the equilibrium of fuel oil systems, explains what is meant by stability in its various forms, and discusses such phenomena as incompatibility and emulsibility. Tests for assessing stability are discussed, and the difficulty of correlating bench tests with large-scale practice is stressed. It is concluded that by close control over the depth of cracking employed, and by using the tests outlined in the paper, it is not only possible to ensure the stability of the fuel oil itself, but also its compatibility with other stable fuels. A strict control of blending operations also ensures a minimum tendency for precipitation. E. S. L.

837. Patents. U.S.P. 2,606,603 (31.3.49; 12.8.52). R. R. Witherell and B. Wright, assrs to Eureka Williams Corpn. Spray type oil burner.

U.S.P. 2,606,604 (27.4.46; 12.8.52). R. R. Witherell, assr to Eureka Williams Corpn. Pressure type oil burner.

U.S.P. 2,606,605 (14.2.50; 12.8.52). H. E. Rucks. Attachment for supporting a chemical decarbonizer or desooter in a pot-type oil burning space heater or furnace.

U.S.P. 2,607,665 (7.4.50; 19.8.52). G. W. Duncan, assr to Standard Oil Development Co. Distillate marine diesel fuel containing a mixture of primary straight chain alkylamines having from 10 to 16 carbon atoms.

U.S.P. 2,608,245 (27.3.50; 26.8.52). E. R. Clark, assr to Peabody Engineering Corpn. Burner ignition and flame detector device.

U.S.P. 2,608,246 (13.8.49; 26.8.52). A. H. Morey, assr to General Electric Co. Fuel supply system for producing a constant flow of fuel at a predetermined rate and temp. J. M. S.

Ger.P. 854,360, 28.8.52. E. Mochrle and H. Franck, assrs to Gesellschaft f. Teerverwertung m.b.H. Method for producing sediment-free tar oils.
BrennstChemie, 1952, **33** (17–18). R. T.

Lubricants

838. Lubricating oils in the internal combustion engine. D. A. C. Dewdney *et al.* *Proc. Third World Petrol. Congr.*, 1951, **7**, 413–22.—The various lubrication requirements of the three main classes of internal combustion engine are discussed in turn, with particular reference to the development and the use of additives for improving pour point, visc index, detergency, and corrosion and oxidation resistance. In both

spark ignition and diesel engine lubrication the tendency towards the use of thinner oils is increasing. For the aviation gas turbine it is essential to have lubricants of low pour point and visc in order to achieve ease of starting at low temp. E. S. L.

839. On the problem of lubricity in the machining and working of metals. E. Kadmer. *Proc. Third World Petrol. Congr.*, 1951, **7**, 343–54.—It is shown that for mineral oils it may be taken as an empirical approximation that the visc increase of oils with pressure is greater, the greater their sp. gr. The boundary-surface reactions of oil constituents and the suitability of broaching tests for evaluating lubricants are then discussed. A comparison is made of the results obtained on emulsions and solutions in the Alman–Wieland oil tester, equipped with untreated, as well as with phosphated, bearings. Finally, the extrusion of steel is described. E. S. L.

840. A practical application of the flash-temperature hypothesis to gear lubrication. T. B. Lane and J. R. Hughes. *Proc. Third World Petrol. Congr.*, 1951, **7**, 320–7.—An empirical formula is derived to predict the scuffing load (W lb lever load) of straight mineral oils on the I.A.E. 3½-inch centre gear rig in terms of visc (Z sec Red.I at 140° F), pinion speed (n r.p.m.) and operating temp (θ° C) as follows:

$$W = n^{-\frac{1}{2}}(700\,Z^{\frac{1}{2}} - 400)$$

E. S. L.

841. Lubrication problems. G. Vogelpohl. *Proc. Third World Petrol. Congr.*, 1951, **7**, 298–303.—In this paper four groups of problems that arise in lubrication are described briefly. These are: (1) the physical nature of lubrication; (2) tasks properly assigned to the machine designer; (3) the properties that make suitable lubrication possible; (4) economic problems connected with lubrication. E. S. L.

842. Engine lubricating oils for the reduction of wear. F. A. M. Buck *et al.* *Proc. Third World Petrol. Congr.*, 1951, **7**, 405–12.—Recent advances in the theory and practice of reducing wear in internal combustion engines by the use of specially compounded lubricating oils are described. Of special importance is the reduction of corrosive wear of cylinder liners and rings. A hypothesis is presented for the method by which corrosive wear of metal surfaces occurs under a protective oil film. An illustration shows how to select the most economical oil drain interval in some types of diesel engine service. E. S. L.

843. Specificity of pour point depressants in lubricating oils. R. A. Ruehrwein. *Proc. Third World Petrol. Congr.*, 1951, **7**, 423–7.—Monomolecular films of a series of n-alkyl polymethacrylates and of two n-alkyl polyacrylates were spread on water, and the temp at which the state of the film changed from solid to liquid was measured. The melting point of the orientated film was found to depend upon the length of the alkyl chain. The pour point depressant activities of the same polymers were measured in petroleum oils. The length of the alkyl side chain on the depressant polymer is specific for optimum depression of an oil of given pour point, the specific alkyl chain length increasing with increasing pour point of the non-treated oil. The temperature coeff of the specific alkyl length is about two carbon atoms per 40° F of pour point. E. S. L.

844. The mechanism of boundary lubrication. F. P. Bowden. *Proc. Third World Petrol. Congr.*, 1951, **7**, 328.—The mechanism of metallic friction and wear are discussed and the part played by localized adhesion at the points of sliding contact. Then it describes the mechanism of boundary lubrication. Electron diffraction studies of the structure and the orientation of the lubricant films are described, and, in particular, the influence of temp both on the orientation and on the frictional behaviour of the film is given. The importance of chemical attack and the breakdown of the lubricant films are investigated. E. S. L.

845. Viscosity–temperature–pressure relationships, their correlation and significance for lubrication. H. Blok. *Proc. Third World Petrol. Congr.*, 1951, **7**, 304.—The author first presents the existing correlations for visc–temp–pressure relationships. These are

then shown to be unsatisfactory for Pennsylvania oil and a new approach is suggested and elucidated that is based on the concept of "similar groups" of oils. Finally, it is demonstrated that whereas increases in visc—under the locally high pressures induced in the oil film between heavy loaded rubbing surfaces—can be quite spectacular, their potentialities for promoting hydrodynamic load-carrying capacity are far from spectacular. 59 refs. E. S. L.

846. Reclaiming system saves oil. Anon. *Chem. Engng*, 1952, **59** (10), 230–1.—Lub oil from eighty-three natural gas engines is treated by heating and flashing off water and volatiles *in vacuo*. This is returned with 400 gal/day to storage. Cutback oil from air filters is centrifuged after settling. D. H.

847. Refrigerator oil developments. A review. W. Seemann. *Erdöl u. Kohle*, 1952, **5**, 791–2.—Use of Freon-12 (CF_2Cl_2) has necessitated special tests for wax and other insolubles pptd by the refrigerant, such should be $<0{\cdot}05\%$. Water limit recommended is 30 p.p.m. Dark oils are more corrosive than pale, hence a test for resin content is required; resin content also serves as a criterion for tendency of oil to cause Cu deposition (observable in equipment using chlorinated refrigerants), since there is direct relationship between resin content and solubility of Cu in oil. Preference for pale oils is also supported by their lesser reactivity with SO_2. Ordinary oxidn tests (*e.g.*, VDE Tar No.) do not assess refrigerator oils satisfactorily. 12 refs. V. B.

848. Detergents for motor oils. C. M. Loane, L. W. Misian, and F. S. Wood. *Proc. Third World Petrol. Congr.*, 1951, **7**, 396–404.—Detergents are used in almost all types of motor oils in the U.S. This paper discusses the use of detergents, types of detergent motor oils, the miscellaneous applications of detergent oils, and the chemical types of detergents. E. S. L.

849. Lubricating oil additives. A. von Hoyningen-Huene. *Erdöl u. Kohle*, 1952, **5**, 779–84.—General review. Distinction previously made (cf. Abs. No. 1945 of 1952) between "dopes" and "additives" is not approved. German production of additives for home demand is insufficient and imports (mainly from U.S.A., and U.K.) will be required for some time. Sections deal with the following additives: V.I. improvers, these are olefin polymers or polymerized esters of methacrylic acid, such bodies are susceptible to breakdown at high shear rates; pour depressors, these are inactive in naphthenic oils where pour point is a visc set; oxidn inhibitors, phenols for low temp effect (preferably $<100°$ C), amines and also Sn compounds for high temps, organic S + P compounds for max overall efficacy; detergents, mode of action of which is explained, soaps of Ba, Ca, and Zn being mainly used, detergents cause increased coking, but as such coke is finely dispersed it is innocuous, detergents can be detrimental in two-stroke engines; E.P. additives include both lubricity improvers and film strengtheners, such compounds are mainly based on S, P, Cl, and Pb soaps, combinations of two or more of these are frequently used, but non-corrosive E.P. additives are difficult to produce, difficulties also arise from effect of S on rubber seals at temp $>100°$ C, poor performance of E.P. additives on four-ball tester does not necessarily indicate unsatisfactory operation in practice; rust inhibitors, these are always polar compounds, *e.g.*, metal sulphonates, soaps, amines, many such additives increase emulsibility of oil; foam suppressors, in this field silicones (used at concn of $0{\cdot}001\%$ and less), are outstanding. V. B.

850. Deterioration of lubricating oils in use. F. Oppermann. *Erdöl u. Kohle*, 1953, **6**, 43–4.—Nature of insol impurities and sol oxidn products occurring in used oils and effect of such deterioration on service in steam turbines, I.C. engines, and electrical equipment is discussed. Following max deterioration limits have been suggested in German publications: steam turbine oil, neut. val. 3, sap. val. 6, ash $0{\cdot}05$; motor oil, neut. val. $0{\cdot}25$, sap. val. $1{\cdot}2$; insulating oils, neut. val. $1{\cdot}5$, sap. val. 3, ash $0{\cdot}01$, dielectric strength (min) 80 kV/cm. V. B.

851. Fundamentals concerning the measurement of grease consistency. G. H. Göttner and G. R. Schulze. *Erdöl u. Kohle*, 1952, **5**, 775–9.—Fundamental characteristic

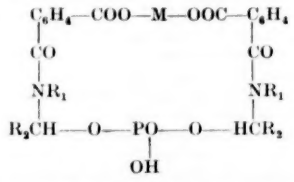
of a grease is its flow property, analogous to visc of a lub oil. Flow requirements of a lubricating grease are considered, it should show a yield value (*i.e.*, not flow under its own wt), resistance to flow should decrease when movement commences, temp coeff of consistency should be minimum, flow properties should alter little with shear stress. Nature of grease flow curves is discussed, *i.e.*, influence of time, yield values, plug flow, flow profile, sigma effect (difference in orientation between grease layers near to tube wall and those farther removed therefrom, shown as diminution of visc (at equal boundary shear stress) with decrease in capillary dia). Velocity gradients in grease-lubricated equipment can attain order of 10^6 sec^{-1}, and laboratory measurements in this region are very difficult. Complete grease flow diagram is sketched, ranging from slight elastic deformation below the yield value to turbulent flow, intermediate stages being plug flow, transitional flow, structure-viscosity, pure viscous flow. V. B.

852. Limiting factors in the manufacture of lubricating grease. S. J. M. Auld, H. M. Davies, and E. G. Ellis. *Proc. Third World Petrol. Congr.*, 1951, **7**, 355.—Four limiting factors affecting lubricating grease production are discussed: scientific knowledge of grease structure, raw materials, the manufacturing process, and methods of test. E. S. L.

853. Developments in the field of soda base greases. A. Bondi *et al.* *Proc. Third World Petrol Congr.*, 1951, **7**, 373–95.—A summary of data pertinent to the understanding of anhydrous soda base grease is presented, and a few applications of these data are outlined. The lubricants considered indicate that their consistency is due to the presence of the soap in the shape of very thin fibres. The mechanical behaviour may be largely associated with the geometry of the structure. The kinetics of fibre growth is also explored, and the effect of temp on the mechanical properties of greases described. E. S. L.

854. Preparation and properties of greases. R. T. Macdonald *et al.* *Oil Gas J.*, 5.1.53, **51** (35), 54.—Additives for greases, silica aerogel thickened greases, continuous manufacture of lithium grease, and performance of synthetic greases are dealt with. G. A. C.

855. Patents. U.S.P. 2,606,152 (8.11.49; 5.8.52). H. G. Smith, T. L. Cantrell, and J. G. Peters, assrs to Gulf Oil Corpn. Corrosion inhibitors for mineral oils are compounds of the general formula:—



wherein M is a divalent metal, R_1 is an alkyl or alkenyl group of 8 to 22 carbon atoms, and R_2 is hydrogen or an alkyl group, or salts thereof.

U.S.P. 2,606,153 (25.4.51; 5.8.52). N. G. Holdstock, assr to General Electric Co. Grease consisting of a liquid organopolysiloxane base fluid and lithium 2-ethylhexoate.

U.S.P. 2,606,154 (1.7.48; 5.8.52). H. D. Hartough, assr to Socony-Vacuum Oil Co. Metal deactivating additives for lub oils are thenyl formaldimines of the general formula $RC_4N_2SCH_2N{:}CH_2$, wherein R is hydrogen, a lower alkyl group, or a $-CH_2N{:}CH_2$ group.

U.S.P. 2,606,182 (7.6.47; 5.8.52). J. M. Musselman, assr to Standard Oil Co. Lub oil additive is made by reacting phosphorus pentasulphide, hydrogenated sperm oil, babassu oil or degras, and a polypropene or polybutene.

U.S.P. 2,606,872 (6.12.48; 5.8.52). W. Gasser and P. R. van Ess, assrs to Shell Development Co. Lub oil containing an oil-soluble alkali metal petroleum sulphonate and an oil-soluble basic alkaline earth metal petroleum sulphonate, in a ratio of from 1 : 4 to 2 : 3 respectively.

U.S.P. 2,606,874 (U.K. 23.6.47; 12.8.52). P. J. Garner and P. A. Winsor, assrs to Shell Development Co. Water-in-oil emulsion consisting of mineral oil, water, a water-soluble sulphate salt of an aliphatic alcohol containing from 7 to 18 carbon atoms, and 1 : 2-octanediol.

U.S.P. 2,607,732 (21.6.50; 19.8.52). K. Duchon and F. H. MacLaren, assrs to Standard Oil Co. Lubricant comprising bitumen, lead naphthenate, and an olefin polymer having a mol wt of 500 to 25,000.

U.S.P. 2,607,733 (21.6.50; 19.8.52). D. R. Oberlink and W. C. Fredericks, assrs to Standard Oil Co. Lubricant comprising bitumen and lead naphthenate.

U.S.P. 2,607,734 (20.5.50; 19.8.52). L. W. Sproule, W. C. Pattenden, and L. F. King, assrs to Standard Oil Development Co. Anhydrous greases are made by saponifying a saturated mono- or di-hydroxy fatty acid having 12 to 24 carbon atoms with lime in the presence of a lub oil at a max cooking temp below 275° F, and adding further lub oil while cooling with continuous stirring until 200° F is reached.

U.S.P. 2,607,735 (12.3.49; 19.8.52). L. W. Sproule, L. F. King, and W. C. Pattenden, assrs to Standard Oil Development Co. Anhydrous greases consist of a lub oil, an alkaline earth metal soap of a saturated hydroxy fatty acid having 12 to 24 carbon atoms, and a salt of the same metal with an acid having a mol wt below 160. The greases may also contain a vegetable wax.

U.S.P. 2,607,736 (19.7.46; 19.8.52). F. M. Watkins, assr to Sinclair Refining Co. Additives for lub oils are made by reacting a fractionated turpentine consisting of 92% α-pinene, 4 to 5% camphene, and 3 to 4% dipentene, with phosphorus sulphide at 200° to 300° F.

U.S.P. 2,607,737 (9.7.49; 19.8.52). R. L. Woodruff, W. T. Stewart, and W. Lowe, assrs to California Research Corpn. The corrosivity of sulphur containing lub oils is inhibited by addition of a condensation product obtained by reacting equimolar proportions of a 2-mercaptothiazole, formaldehyde, and an alkylphenol having 12 to 18 carbon atoms in the alkyl group.

U.S.P. 2,607,745 (5.5.49; 19.8.52). J. E. Magoffin assr to Eastman Kodak Co. Composition useful as antioxidant for fats and oils comprises propylene glycol and a tertiary alkylated hydroxy phenyl ether.

U.S.P. 2,607,746 (26.7.49; 19.8.52). J. E. Magoffin, assr to Eastman Kodak Co. Composition useful as antioxidant for fats and oils comprises propylene glycol, an ester of gallic acid, a tertiary alkylated hydroxy phenyl ether, and citric, orthophosphoric, tartaric, or ascorbic acid. J. M. S.

U.S.P. 2,609,342 (3.12.49; 2.9.52). J. R. White, O. H. Clark, and W. W. Woods, assrs to Socony-Vacuum Oil Co. A lubricant consisting of glycerine or ethylene glycol and 0·5 to 90% by weight of comminuted disulphide of molybdenum, titanium, tin, zirconium, or tungsten.

U.S.P. 2,609,343 (12.7.48; 2.9.52). C. E. Saunders and C. M. Murphy. Lubricating composition comprising an alkyl diester of a dicarboxylic acid and an oxidation-inhibiting amount of phenothiazine, phenolselenazine, or phenotellurazine.

U.S.P. 2,610,946 (8.2.51; 16.9.52). G. W. Eckert, assr to Texas Co. A lubricating grease comprises a liquid lub base, 10 to 30% by weight of a lithium soap of a saturated fatty material, and 0·25 to 3% by weight of an oil-soluble basic alkaline metal earth salt of a sulphonated hydrocarbon having a specified metal to sulphur content.

U.S.P. 2,610,948 (23.3.50; 16.9.52). A. L. Morway and W. C. Howell, assrs to Standard Oil Development Co. A lub composition comprising a synthetic lub oil which is a residue remaining after distillation at 542° to 740° F of OXO products and has a specified viscosity and flash point, and, as a viscosity index improver, polymers of acrylate esters, methacrylate esters or *iso*butylene, or copolymers of styrene and *iso*butylene.

U.S.P. 2,611,742 (17.12.49; 23.9.52). E. M. Kipp, assr to Aluminum Co. of America. A lubricating composition having extreme pressure characteristics, comprising a major proportion of a hydrocarbon lubricating oil and a minor proportion of a substance formed by contacting an animal or vegetable oil with BF_3, this substance being present in an amount which provides 0·001 to 3% by weight of BF_3 in the composition.

U.S.P. 2,612,472 (28.5.49; 30.9.52). A. J. Morway and P. V. Smith, assrs to Standard Oil Development Co. A lub grease comprises a major proportion of lub oil thickened to grease consistency with a combination of a metal soap of C_{12-24} fatty acids, a metal salt of an organic acid of mol wt below 160, and a metal salt of a branched chain aliphatic carboxylic acid having 10 to 20 carbon atoms, at least 2 of which are tertiary and having at least one thioether linkage in the chain. D. A. R.

Bitumen, Asphalt, and Tar

856. Hydraulic transportation of oil-sand tailings in small diameter pipes. A laboratory scale study. W. R. Bruce, G. W. Hodgson, and K. A. Clark. *Canad. Min. metall. Bull.*, Dec. 1952, **45**, 728–32.—In the processing of Athabasca oil sands for oil recovery, the economical disposal of sand tailings is of great importance, since the quantity to be transported amounts to 1 ton of sand for every brl of oil extracted. With the idea of employing the hydraulic pipeline method, investigations were made to determine the flow characteristics of the tailings. It was found that: (1) increasing the temp from 100° to 160° F brought about a change in the critical velocity from 8·5 ft/sec to 8·1 ft/sec; (2) the effect of solids conc was much more pronounced with a change from 25 to 49% solids bringing about a change in critical velocity from 6·6 ft/sec to 8·8 ft/sec; (3) pipe size had an appreciable effect on the critical velocity—for a 50% solids suspension, the critical velocity was 8·4 ft/sec in a 2-inch pipe and only 6·9 ft/sec in a 1-inch pipe. W. H. C.

857. Use of chlorine as a catalyst in the blowing process. O. Pauer and M. M. Haruni. *Erdöl u. Kohle*, 1952, **5**, 771–3.—Starting material was topped Egyptian crude having sp. gr. (20° C) 0·947, Red. I 100° F 1275″, 15% vol. at 300° C. Blowing was at 200° C using 10 litres air/hr for 120 g charge. Duration 1–6 hr, Cl in air 0 to 4%. All samples blown with air only for <4 hr, and all samples with up to 3% Cl in air blown for <3 hr had pen (25° C/100 g/5 sec) >400 and m.p. (R. & B.) $<15°$ C. Results (given in detail) indicate that Cl is a definite catalyst for the blowing process; blowing with Cl-containing air causes marked change in properties of blown bitumen (as compared with use of air alone), although percentage of asphaltenes, carbenes, carboids is not greatly altered. All blown bitumens showed considerable increase in N content. Substitution of Cl in bitumen is but slight, max Cl content of blown material being $<1\%$. Slop oil formed (per hr) fell from 5% (air alone) to 0·7% (air + 4% Cl). V. B.

858. Bituminous soil stabilization in Kansas. D. R. Lacy. *Rds & Str.*, 1952, **95** (12), 72.—A local application of bituminous soil stabilization in Kansas is described. The problem was to construct a cheap yet sound road which would not involve heavy subsequent upkeep. Data were first obtained on the subgrade soil and bituminous stabilized mixtures, using the triaxial compression test. Using the Kansas Method of base design, the necessary constructional data were collected. The cutback used was MC3 grade applied at 180° F. Details of the procedure employed are given. The job was finished with a 1½-inch surface course of dense-graded bitumen mix using sand–gravel aggregate, mineral filler, and MC4 cutback. R. H.

859. The use of asphaltic bitumen for the construction of dykes in the Netherlands. A. Burger and R. E. Kerkohver. *Proc. Third World Petrol. Congr.*, 1951, **7**, 472–84.—The use of bituminous mixtures in dyke construction is discussed, together with a consideration of the properties of such mixtures. E. S. L.

860. Influence of rubber additions on some mechanical properties of asphaltic bitumen. H. C. J. De Decker and H. A. W. Nijveld. *Proc. Third World Petrol. Congr.*, 1951, **7**, 496–504.—The mechanical properties of asphaltic bitumen and rubber mixtures

are compared with those of blown bitumens. Samples of asphalt sheet compositions containing the above bitumens and bitumen–rubber mixtures are tested as to mechanical stability, elasticity, and impact resistance. The influence of rubber addition and of heating time on mechanical properties is discussed. E. S. L.

861. Choice of asphalt for asphalt roofing. E. H. Berger. *Proc. Third World Petrol. Congr.*, 1951, **7**, 485–45.—The development of asphalt roofings and the effects of the discovery of new crude petroleums and the asphalts produced from them upon the progress of this development are described. Fundamental properties required in asphalts for the manufacture of asphalt roll roofings and shingles, and for use as mopping cement in built-up roofings are discussed. Tables covering these characteristics are included. E. S. L.

862. Utilization of bitumen for the agglomeration of coal fines. R. Brossard and F. Chapins. *Proc. Third World Petrol. Congr.*, 1951, **7**, 466–71. (In French.)—The process of combining coal pitch with coal fines to produce compressed fuel are examined to emphasize its inconveniences. The authors believe that a liquid pitch offers important advantages. Changes in the quality of the products obtained with petroleum pitch by varying the percentage and characteristics of the binder utilized are discussed. E. S. L.

863. Asphalt membranes—their potential uses in highway and airfield pavement design. J. R. Benson. *Rds & Str.*, 1952, **95** (12), 78.—The load bearing capacity of the sub-grade is important in that it influences the thickness of the pavement, and particularly of the base course. In many cases the sub-grade is strong only so long as it is relatively dry. Hence control of the moisture content of the sub-grade is important. A new method of achieving this has been suggested, based on the use of asphalt membranes in the lining of canals and reservoirs. For roadways or airfields such a membrane may be applied either in prefabricated form, or by hot spraying of bitumen at a rate of 1·5 to 2·0 gal/sq. yd. Many details of application are given, and the many possibilities of this type of work are discussed. R. H.

864. Electron microscopy of soil clays and related materials. E. B. Kinter, A. M. Wintermyer, and M. Swerdlow. *Publ. Rds, Wash.*, 1952, **27** (5), 89.—The design, construction, and maintenance of highways is known to be influenced by the properties of the soil. Further, it is also appreciated that the physical behaviour of soil systems is dependent to a great extent upon the clay fractions. Many techniques to investigate the properties of clay have already been established, but further tools are required. The authors have set out to assess in a preliminary way the value of the electron microscope technique in this type of work, and to obtain data upon soil clays, for comparison with similar data obtained by other means. Electron micrographs of several soils and clay minerals are included. The details of the technique employed are given. R. H.

865. A co-operative study of fillers in asphaltic concrete. C. A. Carpenter. *Publ. Rds, Wash.*, 1952, **27** (5), 101.—The use of local aggregates in highway construction can lead to a reduction in cost of any project. A programme of work has been carried out to determine by laboratory test the value of many fillers available in Massachusetts, U.S.A., for use in asphaltic concrete. It was found that the four-day immersion period at 120° F of the standard immersion-compression test, generally differentiates between satisfactory and unsatisfactory fillers. In doubtful cases longer immersion periods (seven or fourteen days) are helpful. Very full experimental data are included in the article. R. H.

866. Patents. U.S.P. 2,609,305 (24.7.47; 2.9.52). J. C. Roediger, assr to Standard Oil Development Co. Process for preparing asphalt coated aggregate in which the aggregate is first treated with the vaporized monomer of methyl trichlorsilane in concentrations which increase as particle size of aggregate diminishes.

U.S.P. 2,610,956 (8.12.48; 16.9.52). J. C. Derksen and F. M. Jacobs, assrs to Hartford National Bank and Trust Co. A method of homogeneously mixing an

asphalt bitumen with polyethylene comprises first mixing the polyethylene with a low melting point asphalt bitumen and then adding a high softening point asphalt bitumen to the resulting mixture. D. A. R.

Special Hydrocarbon Products

867. The application of petroleum oils in the manufacture of power cables. A. W. Thompson. *Proc. Third World Petrol. Congr.*, 1951, **7**, 428–38.—A brief summary is given of the types of petroleum oil used in the manufacture of power cables. Various types of cables in which oil is used, and the different requirements for each, are described. Emphasis is laid on the more important methods of testing. Some attempt is made to relate the behaviour and the life of cables to characteristics of the oils used. 25 refs. E. S. L.

868. The dielectric losses of insulating oils at variable frequencies. A. Marter and J. Monbrun. *Proc. Third World Petrol. Congr.*, 1951, **7**, 439. (In French.)—The dielectric losses of an insulating oil are due at low frequency to the presence of ionized compounds, at high frequencies to the vibration of polar compounds. Determinations at variable frequencies reveal the disappearance of these ions and these dipoles during refining operations on petroleum products, or their formation during oxidation tests. This method may be usefully applied to the study of oil destined for use in the electric field. (Authors' Abstract.) E. S. L.

869. Toxicity of herbicidal oils. A. S. Crafts, H. B. Currier, and O. A. Leonard. *Proc. Third World Petrol. Congr.*, 1951, **5**, 198–203.—Toxicity of herbicidal oils is classified, different hydrocarbons cause different types of injury to plants. Oil toxicity increases through the series benzene, toluene, xylene, trimethyl benzene. It is proposed oil toxicity results from the accumulation of the toxiants in the delicate living cell membranes. 8 refs. E. S. L.

870. The use of petroleum oils as herbicides in Great Britain. G. W. Ivens, E. K. Woodford, and G. E. Blackman. *Proc. Third World Petrol. Congr.*, 1951, **5**, 192–7.—The development of petroleum oils as herbicides for umbelliferous crops in Great Britain is reviewed. Toxicity appears to be related to aromatic content and b.p., but is not close enough to allow prediction without field tests. Methods of testing individual hydrocarbon toxicity are discussed. Results suggest that types of compounds other than aromatic also influence oil toxicity. E. S. L.

871. The use of petroleum oil fractions as insecticides for citrus in California. L. A. Riehl. *Proc. Third World Petrol. Congr.*, 1951, **5**, 204.—In California petroleum oil fractions have proved to be the most efficient insecticide per unit cost for most of the dominant insect and mite pests of citrus in the area. The development of oils for citrus, their role in the pest control programme for this crop, the response of the citrus tree to oil treatments, and the recent investigations in this field are reviewed. It has become increasingly apparent that consideration must be given to the inter-relationship of two aspects of the application of spray oils to citrus trees, the insecticidal efficiency of the oil, and the response of the tree to the presence of that oil. 66 refs. (Author's Abstract.) E. S. L.

872. Composition and utilization of polycyclic aromatics from high temperature cracking. E. T. Borrows, W. E. Huggett, and H. Steiner. *Proc. Third World Petrol. Congr.*, 1951, **5**, 159–71.—The polycyclic aromatic products obtained in the "Catarole" process, which produces, by cracking, raw materials from oil for further synthesis, are investigated. Liquid products vary from 70 to 30%, and are almost entirely aromatic. The polycyclic aromatics of water gas tar were found to resemble those obtained from the "Catarole" process, and it is considered other aromatic residues obtained in cracking will have some similarity. Most products and compounds discussed have been isolated previously from coal tar. Cracking products do not contain oxygen and nitrogen compounds, as do those from coal tar, but are pure hydrocarbons with sometimes traces of sulphur. This simplifies their commercial utilization.

Chemical compositions of fractions are described, and the utilization of the fractions and the pure hydrocarbons derived from them discussed. 21 refs. E. S. L.

873. Oil carbon blacks in rubber compounding. R. W. Leslie and W. B. Reynolds. *Proc. Third World Petrol. Congr.*, 1951, **5**, 150–8.—Furnace carbon blacks produced from petroleum distillate or heavy oils are of increasing importance in the rubber industry. Blacks of varying properties can be produced which have usefulness in natural rubber and a variety of synthetic rubbers. Simultaneous research and development in the fields of carbon black and synthetic elastomers makes possible the development of improved rubber compounds, since valuable properties of a new black are often additive to valuable properties of a new rubber. The exceptionally long wearing tyre treads from the combination of cold rubber with HAF black resulted from this type of research and development. New experimental carbon blacks and new experimental rubbers offer promise of still further technical advances in the future. Properties of various carbon blacks in various rubber tread stocks are tabulated. (Authors' Abstract.) E. S. L.

874. Water-vapour permeability of waxed paper. II, III. A. Kreyenbuhl. *Rev. Inst. franç. Pétrole*, 1953, **8**, 24–9 (cf. Abs. 1174 of 1952).—Tests made on water vapour permeability (P) of films of paraffin and microcrystalline waxes. Apparatus and technique for preparing wax films are described and illustrated; wax is melted on hot Hg, and after cooling latter wax film is removed. P is measured as described in previous paper. Samples tested were paraffin wax (m.p. 81° to 82° C) and two microcryst waxes (m.p. 68° to 71° C, 74° to 76° C) and mixture of paraffin wax with harder microcryst. For thick (0·5 to 1 mm) films all the materials have substantially equal P, for thinner films microcryst wax is superior. Test accuracy is considered to be $\pm 10\%$, effect of barometric pressure, temp, and air humidity is discussed; control of last two factors (by air conditioning) and taking of other special experimental precautions (use of smaller dishes, blank test) is desirable when measuring $P < 10$ g/m²/24 hr.

V. B.

875. Patents. U.S.P. 2,606,107 (1.11.43; 5.8.52). L. F. Fieser, assr to the U.S.A. as represented by the Secretary of War. Incendiary gel comprising 84 to 92% of a light liquid hydrocarbon fuel thickened with 8 to 16% of a composition comprising 1 to 2·5 parts of an aluminium soap of a saturated fatty acid of 8 to 14 carbon atoms and 1 to 1·25 parts of a naphthenic acid or an unsaturated fatty acid of 17 to 22 carbon atoms or an aluminium soap thereof.

U.S.P. 2,606,137 (27.6.50; 5.8.52). A. French, assr to Standard Oil Co. Decalcomania transfers are applied to wax surfaces by applying to such a surface a solution of a copal resin in an aliphatic oxygenated solvent, permitting the solvent to evaporate to form a resinous film on the surface, and applying the decalcomania transfer.

U.S.P. 2,606,139 (26.5.48; 5.8.52). H. G. Guy, assr to Koppers Co. Pesticidal compositions comprising *N*-vinylcarbazole and tetraethylpyrophosphate.

U.S.P. 2,606,165 (31.12.48; 5.8.52). E. C. Chapin and L. E. Weeks, assrs to Monsanto Chemical Co. Floor polishing composition comprising an aqueous emulsion containing a copolymer of acrylic or methacrylic acid, an alkylacrylate and styrene, a chlorinated diphenyl, and a wax.

U.S.P. 2,606,829 (11.8.49; 12.8.52). A. E. Chester and C. L. Ricketts, assrs to Poor & Co. Slake resistant abrasive lime bar comprising Vienna lime, a mineral abrasive, guanidine soap, and wax.

U.S.P. 2,606,830 (8.3.49; 12.8.52). J. Kamlet and W. T. McLaughlin, assrs to Pittsburgh Coke & Chemical Co. Herbicidal composition containing a water-soluble amine salt of a chlorophenoxyacetic acid, a cation-sequestering agent of the formula $RCH_2N(COOX)_2$, wherein R is a radical containing a carboxyl group and X is a monovalent cation, and a non-ionic surface-active agent.

U.S.P. 2,607,673 (21.4.50; 19.8.52). L. D. Goodhue and C. E. Tissol, assrs to Phillips Petroleum Co. Sulphenyl and thiosulphenyl trithiocarbonates are plant defoliants.

U.S.P. 2,608,479 (27.10.50; 26.8.52). L. Q. Boyd and A. A. Endres, assrs to Standard Oil Co. A carrier liquid containing a thiocyano ester or ether is used to destroy crab grass.

U.S.P. 2,608,556 (10.7.50; 26.8.52). V. N. Kalberg, assr to Scientific Oil Compounding Co. A fungicide is made by maintaining a mixture of a phenol and water-insoluble metal quinolinolate at a temp below their decomposition temps until the quinolinolate dissolves in the phenol. J. M. S.

U.S.P. 2,610,974 (20.4.50; 16.9.52). J. W. Nelson, assr to Sinclair Refining Co. As a new composition of matter, a mixture of high mol wt wax acids produced by substantially complete oxidation of microcrystalline wax containing 34 to 55 carbon atoms per molecule, characterized by extreme water insolubility, and by a saponification number less than 200 and predominating in monocarboxylic acids of apparent chain length exceeding 18 carbon atoms per molecule.

U.S.P. 2,611,734 (29.6.50; 23.9.52). W. P. Ridenour, assr to Gulf Research and Development Co. A mixture of paraffin waxes comprising up to 5% by weight of a wax recovered by solvent dewaxing a foots oil discard having a melting point of at least 115° F and a tensile strength of at least 100 p.s.i., and a refined wax having a melting point of at least 115° F and a tensile strength of at least 150 p.s.i., the mixture having a melting point and a tensile strength substantially equal to those of the refined wax. D. A. R.

Ger.P. 854,345, 28.8.52. O. Klopfer, H. Jochinke, and H. Spannagel, assrs to Bad. Anilin- & Soda-Fabr. Process for obtaining pure *m*-xylene.

Ger.P. 854,215, 28.8.52. E. Rindtorff and K. Schmitt, assrs to Bergwerksgesellschaft Hibernia A.G. Method for formaldehyde production.

Ger.P. 852,991, 21.8.52. W. O. Herrmann and W. Haenel, assrs to Rudolf Decker u. Hellmuth Holz. Method for producing org compounds containing oxygen.

Ger.P. 854,352, 28.8.52. E. Keunecke and A. Kürzinger, assrs to Bad. Anilin- & Soda-Fabr. Method for producing oxidn products from hydrocarbon mixtures.
BrennstChemie, 1952, **33** (17–18). R. T.

Derived Chemical Products

876. Properties and applications of solvents synthesized from petroleum raw materials. J. G. Dickerson. *Proc. Third World Petrol. Congr.*, 1951, **5**, 172–88.—Various solvents produced from petroleum are discussed, with emphasis on their industrial applications. Derivation of solvents from petroleum hydrocarbons is discussed and diagrammatically illustrated. The principal applications of individual solvents are listed, and automotive, plastics, protective coatings, drugs and cosmetics, petroleum processing, and ink fields are discussed, together with many lesser ones, from the solvent viewpoint. Special properties of solvents are given. E. S. L.

877. Properties and application of petroleum derived synthetic detergents. A. H. Lewis, A. L. Meader, and D. F. Searle. *Proc. Third World Petrol. Congr.*, 1951, **5**, 127–37.—Chemical, physical, and performance properties of a balanced polypropylene benzene sulphonate detergent are presented and discussed. The physical properties considered are surface and interfacial tensions, wetting, adsorption on cotton, suspending power for mineral particles, and foaming. Fabric detergency is investigated by three methods, bulk solution and concentrated phase properties are mentioned, and the need for a proper balance of all properties is emphasized. E. S. L.

878. Production of detergents from petroleum. F. D. Snell, L. H. Allen, and R. A. Sandler. *Proc. Third World Petrol. Congr.*, 1951, **5**, 109–18.—The reasons for the continually expanding production of petroleum-based synthetic detergents are discussed briefly. Using a built alkyl aryl sodium sulphonate as a typical example of petroleum derived synthetic detergents, the raw materials requirements, processing steps, the characteristics of drum-dried and spray-dried products, equipment requirements, and materials of construction are outlined in some detail. A typical product

formulation is given, and the raw material and plant utility requirements for 1 ton of this product are noted. Production costs, in a small plant, are roughly 14 to 15 cents/lb of dried built alkyl aryl sodium sulphonate detergent. (Authors' Abstract.)
E. S. L.

879. Surface-active agents from petroleum—history and statistics. J. R. Skeen and F. D. Snell. *Proc. Third World Petrol. Congr.*, 1951, **5**, 119–26.—The steady increase in the proportion of surfactants derived from petroleum, as indicated by the U.S. Tariff Commission, is discussed. The production of organic surface active agents for years 1943–50 is tabulated by groups. Many surfactants are of mixed origin. The history of the appearance on the market of each major type is reviewed. E. S. L.

880. Detergents from petroleum—production and properties. F. D. Snell and I. Reich. *Proc. Third World Petrol. Congr.*, 1951, **5**, 99–108.—The general history, properties, mol structure, and types of synthetic detergents are discussed. Petroleum-based synthetic detergents are superseding fat-based detergents for economic reasons. Nonionic detergents are developing rapidly. Future trends are considered.
E. S. L.

881. Synthetic detergents from petroleum. W. K. Griesinger and A. B. Hersberger. *Proc. Third World Petrol. Congr.*, 1951, **5**, 87–98.—A description of typical methods used to manufacture the more common anionic, cationic, and nonionic synthetic detergents from petroleum is given, with particular emphasis on the alkyl aryl sulphonates. Detergent properties which have contributed to the wide-spread household and industrial applications of these materials are mentioned, along with the test methods used for evaluation. Recent U.S. production statistics for the leading type products are also included. 23 refs. (Authors' Abstract.) E. S. L.

882. Synthetic detergents up to date. II. J. W. McCutcheon. *Soap, N.Y.*, Oct. 1952, **28** (10), 51.—Pt. IV of a series listing synthetic detergents by trade name.
Manufacturer, chemical composition, and percentage concentration, physical form, and main uses are given. M. V. J.

883. Petroleum chemicals at Wilton. Anon. *Petroleum, Lond.*, Jan. 1953, **16** (1), 19–21.—Describes the petrochemicals plant operated by Billingham divn of I.C.I. Ltd., at Wilton, Yorks. The major chemical products of this plant, which has a capacity for processing 250,000 tons of feedstock a year, are ethylene and propylene, which are the starting materials for a large number of important products, including polythene, detergents, anti-freeze, Perspex, and a new polyester fibre, Terylene. Considerable quantities of gasoline are also being produced. R. E. P.

Coal, Shale, and Peat

884. Oil from coal. T. E. Warren and K. W. Bowles. *Canad. Min. metall. Bull.*, Nov. 1952, **45**, 667–70.—A short review is given of the oil-from-coal industry, and the research investigations of the Mines Branch, Ottawa, on the coal hydrogenation process are described. The present status and future trend of the synthetic fuel industry are evaluated with special reference to the research investigations needed. W. H. C.

885. Patent. U.S.P. 2,609,331 (17.6.47; 2.9.52). L. K. Cheney, assr to Sinclair Refining Co. Oil shale, prior to retorting, is ground with water to give a slurry, treated with hydrogen chloride or hydrogen fluoride, filtered to remove excess water, and dried. D. A. R.

Miscellaneous Products

886. Petroleum in wood preservation. J. A. Vaughan. *Proc. Third World Petrol. Congr.*, 1951, **5**, 189–91.—The use of petroleum in wood preservation is discussed, its mixture with coal-tar creosote and its use as a solvent for oil-borne preservatives being mentioned. Special thermal and cat processes have been used to produce a creosote

from petroleum, the properties of which can be varied to suit different applications. This creosote also has certain characteristics different from the normal coal-tar creosote, one of which is its ability to produce unusually clean treatment. E. S. L.

887. Metallurgical petroleum coke, a promising product of petroleum refining. P. W. Sherwood. *Erdöl u. Kohle*, 1952, **5**, 774–5.—Pet coke production in the U.S.A. (1950) was 3·4 million tons (1·2% on refinery feeds), 48% used as fuel, 20% in Al industry, 10% for steel manufacture, 7% for electrodes. Metallurgical coke has value of $21/ton, as against $6 for fuel coke. U.S. Al industry has annual requirement of 900,000 tons low-ash coke. Metallurgical coke should have (max) 8% volatiles, ½% S, ¾% ash, requirements for electrode coke are less stringent. Description is given of continuous contact coking process, a development of Thermofor cat cracking. Oil heated to 400° to 450° C and contacted with 6/18 mm coke, proportion of this being continuously withdrawn as product, remainder circulating round system. Coke thus produced meets most metallurgical requirements, typical yield (wt) being 11½%. Liquid products (vol) are gas oil 75½% and gasoline 15%. Process is applicable to highly coking feed stocks, such as from the Alberta tar sands. V. B.

888. Removal of sulphur from petroleum coke by pyrolysis. W. C. Schafer. *Colo. Sch. Min. Quart.*, July 1952, **47**, 27–37.—Sinclair coke and Standard Oil coke, which contained 1·5% and 0·4% sulphur, respectively, were subjected to prolonged exposure to hydrogen, methane, and oxygen at about 1600° F. The total reduction of sulphur varied from 14·0 to 23·3%. The conclusions drawn from this investigation were: (1) the characteristic thermal stability of sulphur compounds in crude oils is present also in coke and residual stocks; (2) the presence of various atmospheres may or may not have an effect on the reaction; (3) if the reaction is influenced by various atmospheres, the data indicate that sulphur present in coke is cyclic in character; (4) the absolute removal of sulphur from coke is extremely difficult, and probably only possible at the high temperatures generated by the carbon arc. W. H. C.

889. A study of methods of removing sulphur from petroleum coke. F. K. Sabott. *Colo. Sch. Min. Quart.*, July 1952, **17**, 1–22.—Results are given of the removal of sulphur from petroleum coke, by treatment with various molten materials, solvents, and gases. By far the best results were obtained with unsaturated gases. Propylene removed 94·5% of sulphur; ethylene, 92·4%; butene-2, 92·1%; and the amount of sulphur left in the coke was $\frac{1}{10}$%. Ammonia removed 28%. Of solvents, pyridine removed 19%; bromine, approx 40%; chlorex, furfural, aqua regia, molten NaOH, molten naphthalene, molten phenol removed approx the same amount of sulphur, *i.e.*, roughly 14%. W. H. C.

890. Metal cleaners. Pt. I. M. A. Lesser. *Soap, N.Y.*, Oct. 1952, **28** (10), 42.—Test methods, cleaning processes, and types of cleaners suitable for various processes and metals are reviewed. Alkaline soak type cleaners are considered in some detail and formulæ quoted. 41 refs are included. M. V. J.

891. Conductive floor waxes. W. W. Walton. *Soap, N.Y.*, Oct. 1952, **28** (10), 159.—The paper discusses briefly the requirements for waxes for conductive floors, such as those in hospital operating rooms, and suggests there is scope for improvement.
M. V. J.

892. Bacteria removal by hand dishwashing detergents. L. Flett and A. Guiteras. *Soap, N.Y.*, Oct. 1952, **28** (10), 48.—Tests made under normal operating conditions in a small restaurant are reported.

Comparisons were made: (1) between 1·0% sodium sesquicarbonate soln and a 0·7% soln of a mixture of 80 parts sodium sesquicarbonate and 20 parts Nacconol NR (alkyl aryl sulphonate); (2) between 0·15% Nacconol NR soln and 0·15% soap soln.

At the beginning, middle, and end of the wash counts were made of bacteria in dish water and residual bacteria on dishes. Little correlation between bacteria on dishes and bacteria in water was found, the former remaining fairly constant throughout the wash, and the latter increasingly rapidly. Towel dried plates were more contaminated than drain dried ones. In all cases the synthetic detergent was most effective, giving almost sterile drain dried dishes and lowest counts in the dish water. M. V. J.

893. Iodine as a bactericide. C. W. Chambers, P. W. Kabler, G. Malaney, and A. Bryant. *Soap, N.Y.*, Oct. 1952, **28** (10), 149.—Work done to assist in evaluating iodine as a bactericide for water treatment is described. Details are given of preparation of glassware, iodine solution, iodine-free, chlorine-demand-free water, buffers, and bacterial cultures, and of method employed in determining bactericidal effect of iodine. Variables examined were exposure time (1, 2, and 5 min), concentration, pH (6·5 to 9·15), and temperature (2° to 5° C and 20° to 26° C). Organisms studied were species of Escherichia, Aerobacter, Salmonella, Shigella, and Streptococci. Results of the experiments are tabulated, and indicate the following: min average iodine concentration killing all species in 1 min under most adverse conditions (pH 9·15 and 2° to 5° C) is 4·3 p.p.m., and under most favourable (pH 6·5 and 20° to 26° C) is 0·6 p.p.m. *S. typhosa* was the least resistant to iodine, and *S. sonnei* I the most.

M. V. J.

894. Patents. U.S.P. 2,610,116 (5.1.50; 9.9.52). L. B. Goodhue and C. E. Tissol, assrs to Phillips Petroleum Co. A method of inhibiting the growth of undesired plants which comprises contacting the same with enough of a 2 : 3 : 4 : 5-bis(Δ^2-butenylene)-tetra-hydrofurfural to inhibit growth.

U.S.P. 2,610,114 (14.6.49; 9.9.52). K. A. Fischer and O. F. Hecht, assrs to the U.S.A (Sec. of the Army).—A solidified hydrocarbon gel is made by emulsifying a liquid hydrocarbon (gasoline) in an aqueous solution of a water-soluble polymeric monovalent salt of an alkali metal or ammonium having repeating $-CH_2CH<$ groups (polyacrylate), and reacting the dispersant phase with an alkaline earth metal chloride, nitrate, or sulphate to convert it into a water- and hydrocarbon- insoluble solid alkaline earth metal complex.

U.S.P. 2,610,949 (13.9.48; 16.9.52). F. J. Sowa. An hydraulic fluid comprising as an essential component a compound of the formula

in which R, R′, and R″ are C_4 to C_{18} alkyl radicals, C_5 to C_8 *cyclo*alkyl radicals, C_6 to C_9 aryl radicals, the benzyl radical, or the phenylethyl radical.

U.S.P. 2,611,728 (1.11.49; 23.9.52). J. H. Bartlett, H. W. Rudel, and E. B. Cyphers, assrs to Standard Oil Development Co. An insecticidal dust composition comprising a cyanoethyl or chloroethyl ester of diethyl dithiophosphoric acid and powdered clay.

U.S.P. 2,611,729 (1.11.49; 23.9.52). J. H. Bartlett, H. W. Rudel, and E. B. Cyphers, assrs to Standard Oil Development Co. An insecticidal composition comprising the styrene ester of diethyl dithiophosphoric acid and powdered clay. D. A. R.

Corrosion

895. The corrosion of lead in the petroleum industry. M. Karsulin and T. Markovic. *Nafta (Yugoslavia)*, **3** (10), 311–15.—Starting with a case of the corrosion of lead in the refrigerating technique, the behaviour of lead in solutions of NaOH, HCl, NaCl, and H_2SO_4 has been investigated. For this purpose, the variation of the potential of lead *vs* time in various concentrations (0·1–0·0001N) of these solutions, has been measured.

In this way it has been established that, after about 10 days, the potential of lead in 0·001N-HCl, as well as in 0·01N-NaOH, reached the values of -320 mV, at which values a strong corrosion of the lead is observed, even in distilled water. However, with concentrations other than that, the potentials of lead never reached the critical region.

Furthermore, the corrosion of lead in H_2SO_4 solutions has been investigated by polarizing the lead against an auxiliary platinum electrode, according to Tödt's method. In the course of these investigations every series of measurements lasted 24 hr. In a general way, with increasing concentrations of the sulphuric acid (up to 10N-H_2SO_4), and finally, a further strong increase in the corrosion was observed with the concentrated acid.

Data describing the corrosive behaviour of lead in systems such as lead–crude oil (light and heavy oils resp.)–concentrated sulphuric acid are to follow. (Authors' Summary.)

896. Some observations on corrosion in engineering. S. F. Dorey. *J. Inst. Petrol.*, 1952, **38**, 885–907.—The characteristics of corrosion experienced in a variety of industries, and the circumstances in which it takes place, are reviewed.

A. R. W. B.

897. Galvanic corrosion—1. Anon. *Oil Gas J.*, 5.1.53, **51** (35), 89; 19.1.53, **51** (37), 131; 26.1.53, **51** (38), 407.—Pt. 1 of this series deals with two types of galvanic cells caused by dissimilar metals and dissimilar electrolytes, and demonstrates fundamental principles for the many known variations of the galvanic cell.

Pt 3 of the series deals with other types of galvanic cells caused by mill scale, dissimilar soils and surface conditions, and by mixtures of different soils.

In pt. 4 of the series survey methods and equipment are described. Methods include a soil-resistivity survey by measuring the electrical conductivity of the soil.

G. A. C.

898. Patents. U.S.P. 2,610,151 (17.12.49; 9.9.52). J. H. Putnam and D. W. Ervine, assrs to Standard Oil Development Co. A non-corrosive oil composition comprising mineral oil of lubricating viscosity, 0·05 to 5% by weight, based on the whole composition, of sodium benzoate, a solubilizer comprising 0·02 to 20% of oil-soluble metal petroleum sulphonate, and about 0·05 to 5% of a stabilizer.

U.S.P. 2,610,919 (8.6.46; 16.9.52). M. P. Kleinholz, assr to Sinclair Refining Co. A rust inhibiting composition for iron and steel having a mineral oil base, 1 to 2% calcium mahogany sulphonate, and 0·5 to 1% of α-hydroxy lauric acid, or a self esterification product of a semi-lactide esterification product of this acid.

U.S.P. 2,611,738 (25.7.47; 23.9.52). G. M. Webb and R. W. Moehl, assrs to Universal Oil Products Co. Hydrocarbon conversion by means of a catalyst prepared by compositing silica hydrogel with a metal oxide, and prior to substantial drying, ageing the composite at an elevated temp and for a period of at least an hour in an ammonium salt solution having a pH value below about 9.

U.S.P. 2,611,789 (17.10.49; 23.9.52). G. M. Good and B. S. Greenfelder, assrs to Shell Development Co. A process for the production of α-olefins by catalytically cracking a feedstock consisting largely of paraffins having at least 6 carbon atoms and having a characterization factor of at least 12·35 at a temp of at least 540° C but not substantially in excess of 700° C and at a liquid hourly space velocity of at least 5, the cat being activated carbon of turbostratic structure, to produce a product consisting predominantly of α-olefins and paraffins.

D. A. R.

Engines and Automotive Equipment

899. Stork–Thomassen engines. P. C. Brunting and G. Wieberdink. *Ingenieur, 's Grav.*, 23.1.53, **65** (4), W13–16.—A description is given of a new two-stroke diesel engine with uniflow scavenging, which has been developed in close co-operation by Royal Engineering Works, Stork Bros. & Co. Ltd. of Hengelo and Thomassen Engine Works of De Steeg. The engine has a maximum speed of 600 r.p.m., with a bore of 240 mm and a stroke of 360 mm.

G. F. T. C.

900. New air-cooled range of diesel engines. Anon. *Gas Oil Pwr*, 1952, **57**, 320.—A representative of this new PB series of Petter engines is described. The eight-cyl four-stroke engine has the cyl arranged in banks of four set at 90° angle. The bore and stroke are each 110 mm, giving a swept volume of 8·36 litres, and the max rating is 83 b.h.p. at 1500 r.p.m.

The Al-alloy pistons carry two scraper and three compression rings, of which the top ring is Cr-plated. Simms fuel injection equipment is used, and injection is direct into a hemispherical combustion chamber in the top of the piston. A centrifugal

governor controls the engine speed, which can be varied between ±10% by adjusting an easily accessible spring.

Lub oil is drawn from the sump by a submerged gear pump and delivered via a cooler to the main bearings through drilled oilways. H. C. E.

901. High-energy spark ignition units for gas turbines. Anon. *Gas Oil Pwr*, 1952, **47**, 314, 317.—A short description is given of a means of igniting fuel in the combustion chambers by means of a high-energy spark. The electrical energy is stored in a condenser, and is periodically discharged when the energy reaches a predetermined value. The igniters must be carefully positioned with respect to the fuel spray cone. H. C. E.

902. Main line diesel locomotives for Ceylon. Anon. *Gas Oil Pwr*, 1952, **47**, 309–11.—The AlA-AlA type locomotives weigh 87 tons in full working order, and are capable of a max of 55 m.p.h. Their constructional details are shortly described. In each the main power unit is a Mirlees Vee-type twelve cyl turbo pressure charged four-stroke engine rated at 1000 b.h.p. at 850 r.p.m. under local conditions. The cyl have a bore of 9¾ inches and a stroke of 10½ inches.

Pressure lubrication is provided from a gear-type oil pump, and if the oil pressure falls below a predetermined value or if the engine speed exceeds a certain limit, the engine is automatically stopped. To start the engine, batteries motor the main generator, but this cannot occur until an electrically operated priming pump has built up sufficient oil pressure in the diesel engine.

Details of the electrical equipment are given. H. C. E.

903. French automotive gas turbine. Anon. *Gas Oil Pwr*, 1952, **57**, 326.—This Cematurbo unit comprises a centrifugal compressor, and its H.P. turbine, three combustion chambers, and a ten-stage L.P. power turbine. Air is compressed by a factor of 3·5, and passes through separate passages to the combustion chambers. Fuel is delivered to the latter at 1000 p.s.i., and combustion is started by ignitor plugs. The unit is run up by a starter motor attached to the compressor shaft. A pressure lub oil pump and two scavenge pumps are provided.

The compressor turbine rotates at 45,000 r.p.m. and the power turbine at 25,000 r.p.m., and the drive is geared down to 5000 r.p.m. The complete unit has a length 39·3 inches and dia 19·6 inches. H. C. E.

904. Larger Leyland industrial engines. Anon. *Gas Oil Pwr*, 1952, **47**, 318.—This 680 type engine has six cyl of bore 5 inches and stroke 5¾ inches, and develops 150 b.h.p. at a governed speed of 2000 r.p.m. The max torque is 450 lb/ft at 1100 r.p.m., corresponding to a b.m.e.p. of 100 p.s.i. The fuel consumption is 0·34 and 0·38 pints/b.h.p/hr at 1100 and 2000 r.p.m. respectively.

Details of the engine construction, and its differences from the older 600 type engine, are given. Pressure lubrication is by means of a gear pump in a wet sump at the rate of 5½ g.p.m. at 1000 r.p.m. C.A.V. fuel injection equipment is used. Auxiliary equipment includes a 24-V lighting and starting motor, lub-oil pressure gauge, fuel oil filter, and lub oil filter. The dry weight of the engine is approx 1925 lb. H. C. E.

905. Vapour phase in a South Coast works. Anon. *Gas Oil Pwr*, 1952, **47**, 312–14.—A description of a commercial installation which uses the waste heat from two Lister 27-h.p., three-cyl diesel engines for space-heating. The recovered heat, in the form of 90 lb steam per hr, is 90,000 B.Th.U., and it is claimed that, due to close control of the engine jacket temp, improved combustion, cleaner engines, and cleaner lub oil are obtained. (See also Abs. 2964 of 1952.) H. C. E.

906. A Werkspoor-Lugt supercharged engine. Anon. *Mot. Ship*, Jan. 1953, **33** (394), 432.—A description, with illustrations, and results of shop trials are given of a four-cyl unit developing 2400 b.h.p. at 160 r.p.m., which is an increase of power from 1800 b.h.p. for this type of engine when normally aspirated. Fuel consumption is 0·352 lb/b.h.p/hr, and mechanical efficiency is 87%. The engine is to run on diesel oil and not on heavy oil. U. M.

907. Progress toward more efficient automobile engines. T. A. Boyd. *Proc. Third World Petrol. Congr.*, 1951, **7**, 143.—This paper discussed: (1) what success has been had so far in getting higher engine efficiencies; (2) how much farther the progression can go; and (3) what is the relative promise of the different routes? Engines have been made more efficient mainly by using higher compression ratios and leaner air–fuel mixtures. In pushing back the barrier of knock far enough to permit still higher compressions and efficiencies the most promising path is to continue with the Otto cycl using gasoline as fuel. There is room both in the engine and the fuel for improvements which will assist in the use of higher compressions and thus higher efficiencies, but greater promise lies in the use of more knock-free gasolines. E. S. L.

908. Automatic control of fuel viscosity in motor ships. Anon. *Mot. Ship*, Jan. 1953, **33** (394), 389.—A short report is given of the Viscorator, manufactured by E. F. Drew and Co., New York, for use with boilers to maintain the correct visc of the fuel at the oil burners, but which could be adapted for use with diesel machinery. Oil from the heaters circulates through the Viscorator and returns to the oil system; when visc of the oil differs from the setting, by as little as 1 SSU, the temp of the heaters is adjusted by use of an air controlled steam valve. The unit also makes a continuous recording of the temp and visc of the oil. U. M.

909. Patents. U.S.P. 2,608,818 (G.B. 11.3.48; 2.9.52). T. Shelley and N. H. Kent, assrs to Rolls Royce Ltd. A power plant comprising a reciprocating internal combustion engine, a supercharging compressor driven through a free wheel device by an exhaust-operated turbine, a variable by-pass to control exhaust flow, and an auxiliary compressor, also exhaust-turbine driven, discharging to the exhaust.

U.S.P. 2,608,819 (27.9.46; 2.9.52). J. R. Moorehead and R. S. Reinhold, assrs to Boeing Airplane Co. An exhaust collector ring for radial engines.

U.S.P. 2,608,820 (30.8.48; 2.9.52). H. A. Berliner, assr to Engineering and Research Corpn. A variable area jet engine tail pipe has two substantially parallel corrugated sides which may be deformed on forcing top and bottom walls towards each other to reduce pipe area, and means for screening corrugations from gas flow.

U.S.P. 2,608,821 (8.10.49; 2.9.52). E. L. Hunsacker. A contra-rotating turbo jet engine having independent bearing supports for each turbo-compressor.

U.S.P. 2,608,961 (22.4.50; 2.9.52). H. H. Albinson, assr to General Motors Corpn. A cooling system for reciprocating internal combustion engines designed to provide cooling for the lubricant and for exhaust passages.

U.S.P. 2,608,962 (Germany, 19.5.50; 2.9.52). R. Kloss, E. G. Engels, and P. Combüchen, assrs to Klocker–Humbolt–Deutz A-G. A working cylinder for an air-cooled internal-combustion engine with cooling fins having their major surfaces in planes transverse to the longitudinal axis of the cylinder, which fins have a graduated series of long narrow notches associated with a discharge stud communicating with the cylinder.

U.S.P. 2,609,065 (22.8.50; 2.9.52). W. A. Douglas, assr to General Electric Co. A gas turbine shaft bearing is lubricated by oil under pressure, which oil also drives an hydraulic motor operating a scavenging pump taking up oil leaking from the bearing and returning such oil to the pressure lubrication system.

U.S.P. 2,609,188 (22.11.48; 2.9.52). E. C. Brehob. Air bleed structure for automatically controlling air and fuel ratio in carburettors at varying engine speeds.

U.S.P. 2,609,655 (17.6.48; 9.9.52). D. M. Poole, assr to United Aircraft Corpn. Gas turbine power plant having a fuel cut-off valve which is caused to close electrically by an overspeeding governor.

U.S.P. 2,609,657 (27.2.50; 9.9.52). H. G. Myhr. Exhaust propulsion engine having sparking plugs for igniting the fuel within exhaust chambers exteriorly of the cylinders.

U.S.P. 2,609,658 (11.5.45; 9.9.52). R. H. Goddard, assr to Daniel and Florence Guggenheim Foundation. Combustion apparatus comprising a combustion chamber having a discharge nozzle at one end and having a closed coaxial extension providing a

target recess at the other end, and a plurality of conical spray plates positioned at the end of the said combustion chamber adjacent said recess and through which plates converging concentric conical sprays of two different combustion liquids are directed towards the closed outer end of said target recess.

U.S.P. 2,609,659 (2.6.45; 9.9.52). N. C. Price, assr to Lockheed Aircraft Corpn. A starting system for internal combustion turbine power plants, including a counter-rotating ring having buckets acted upon by the combustion gases and a nozzle for spouting fluid under pressure against these buckets.

U.S.P. 2,609,660 (25.2.46; 9.9.52). W. L. Tenney and C. B. Marks, said Marks assr to said Tenney. A resonating pulse jet engine including Venturi means for supply fuel in metered relation into the inflowing air for vaporization thereof for combustion with resultant cooling of the valve means.

U.S.P. 2,609,662 (25.7.47; 19.9.52). P. R. Vogt, assr to Chrysler Corpn. In a power plant comprising a burner, means for conducting air and fuel to the burner, and fuel flow regulating means to maintain a predetermined ratio of fuel-flow rate to air-flow rate, which regulating means have delayed response to minor air-flow changes and immediate response to major changes.

U.S.P. 2,609,664 (12.12.46; 9.9.52). A. C. Staley, assr to Chrysler Corpn. An internal combustion turbine comprises means for causing the gaseous products exhausting from the turbine to heat the combustion-supporting medium.

U.S.P. 2,609,806 (7.3.50; 9.9.52). A. H. Winkler, assr to Bendix Aviation Corpn. A carburettor comprising a primary induction passage having a throttle therein, a secondary induction passage having a throttle therein, and means responsive to a pressure drop in said primary induction passage for limiting only the opening movement of said secondary throttle in accordance with the amount of the pressure drop.

U.S.P. 2,609,868 (G.B. 24.2.45; 9.9.52). F. H. Carey, assr to Dowty Equipment Ltd. Fuel supply for gas turbines.

U.S.P. 2,610,098 (25.4.50; 9.9.52). N. M. Reiners, assr to Cummins Engine Co. An internal combustion engine piston ring is associated with a passageway through the piston, whereby the gas pressure in the cylinder head is used to force the piston-ring outwards into conformity with the cylinder. The passageway is designed to clog with carbon after a certain time so that it becomes closed, but the piston ring groove remains substantially free of carbon.

U.S.P. 2,610,464 (1.2.42; 16.9.52). W. A. Knoll. Jet engine having fuel pumps driven by air turbine in thrust-augmenting air duct.

U.S.P. 2,610,465 (6.8.46; 16.9.52). R. I. Imbert and R. Anxionnaz, assrs to Société Rateau S.A. Auxiliary thrust means for jet propelled aircraft comprises a ram jet having an annular duct arranged round the casing of the main jet device.

U.S.P. 2,610,466 (24.6.49; 16.9.52). D. H. Ballantyne and H. E. W. West, assrs to Rolls Royce Ltd. Gas turbine with starting device and automatic fuel control means.

U.S.P. 2,611,241 (19.3.46; 23.9.52). T. R. Schulz, assr to Packard Motor Co. Power plant comprising a toroidal combustion chamber and an axial flow gas turbine with blade cooling passages therein forming a centrifugal air compressor.

U.S.P. 2,611,243 (1.9.44; 23.9.52). A. Huyton, assr to J. Lucas. A prime mover having a plurality of combustion chambers arranged around a common axis, balancing pipes establishing lateral communication between adjacent combustion chambers and also serving at least in part to support the combustion chambers.

D. A. R.

Safety Precautions

910. Planning precautions against petroleum fires. E. E. Chanter. *Inst. Fire Engrs Quarterly*, Dec. 1952, **12**, 211–29.—This paper is a general guide to fire prevention and fire protection for refineries and petroleum installations, etc. It is written on the basis of recommended safe practice, rather than rigid regulations. The burning of petroleum

products and vaporization are discussed, and three main classes of products are specified, and discussed from the aspects of combustible mixtures and their ignition. Site planning, spacing, spacing of tanks, capacities of bunds, and types of tanks are described and discussed. Static electricity and electrical sparks are reviewed, and the limiting of such hazards by restriction of pumping speeds is discussed. Gas freeing of tanks, gas free certificates, and clearance certificates are lengthily discussed. Some notes are given on training, fire-proofing of structures, blow-down systems, liquid gases, and general regulations. Methods of fighting fires are surveyed and discussed under the following headings: sub-surface injection, air stirring, inert gases, mechanical foam, and equipment, in-line inductor, fixed water displacement, multi-jet inductor, positive injection, fixed inlets, foam trailers, and towers. Slop-over and boil-over, burning characteristics of petroleum products are described. W. H. C.

911. Electrical installations—5. B. Z. Segall. *Oil Gas J.*, 17.11.52, **51** (28), 423.—No. 145 in the Refiner's Notebook series deals with sealing systems, and figures show three stages in the progress of flame through a conduit, and sealing requirements of Class I, Division I. G. A. C.

Miscellaneous

912. Oil headlines of 1952. Anon. *Oil Gas J.*, 26.1.53, **51** (38), 366.—Major events in the oil industry, as reported by *Oil Gas J.*, are given month by month, for the year. G. A. C.

913. Statistics relating to the petroleum industry. Anon. *Petrol. Times*, 6.2.53, **57** (1448), 109.—This is comment on the valuable survey of the same title by A. L. King, published in *J. R. statist Soc.*, Pt IV, 1952.

Matters dealt with in the paper include assessment of importance of petroleum among world's energy sources, economics of the British petroleum industry, and a short section on the oil industry of the U.S.A. G. A. C.

914. French crude production in 1952. Anon. *Rev. Inst. franç. Pétrole*, 1953, **8**, 31.—Metropolitan France 353,700 (Lacq 300,600; Pechelbronn 51,400; others 1700); overseas territories 147,000 (Morocco 101,000; Algeria 46,000); total 500,700; also 26,000 C.H.G. from St. Marcet natural gas field. (All quantities in tonnes.) Natural gas production at St. Marcet was 280 million m^3. V. B.

915. West German petroleum and natural gas production, drilling, and refinery production in 1952. Anon. *Erdöl u. Kohle*, 1953, **6**, 47, 48.—Total pet production for 1952 (details given for fifty areas) was 1,755,000 tons (28·4% up on 1951). Natural gas output was 96 million m^3 (25·2%). Total drilling was 473,500 m (17·2%). Refinery feed was 5,340,000 tons, yielding (details given) 3,291,000 tons light products up to and including diesel fuel (16%), 385,000 tons lub oil (2·4%), 844,000 tons fuel (10%), 460,000 tons bitumen (9·4%). Total refinery products were 5,139,000 tons (13·2%). V. B.

BOOK REVIEWS

Principles of Drilling Mud Control. 9th Ed. Petroleum Extension Service, University of Texas, 1952. Pp. 122.

This treatise was first published in 1946, when it was initiated and sponsored by the Committee of Research and Education of the American Association of Oilwell Drilling Contractors. It has the approval of the Committee on Training of the American Petroleum Institute, Division of Production.

It has been constantly revised since then, as shown by the number of editions published, and its object is to provide an up-to-date manual for the training of field personnel in the preparation and maintenance of rotary drilling fluids.

This ninth edition consists of fifteen chapters, the first six of which deal seriatim with the composition of drilling mud, testing, conditioning, the more widely used types, common drilling problems, and special purpose fluids. The next eight chapters describe mud practices in the various petroleum provinces of North America, including Canada, and the final chapter covers calculations used in mud work and related references.

The mud practices described are those observed in the U.S. and Canada, and whilst these cover a very wide field of variety, it follows that many conditions and problems encountered in other parts of the world are not dealt with.

Whilst it would defeat the primary objective of the book to particularize too much, some mention of the following might be made in future editions: measurement of gas cutting, degassing of mud, design and maintenance of mud screens, the use of centrifuges and other desanding equipment, and mud cooling equipment for deep wells.

Nevertheless, this is a clear and concise handbook which should be distributed to all operatives concerned with oil-well drilling so that they are conscious of the great importance which attaches to efficient drilling mud. E. C. S.

Volumetric and Phase Behaviour of Oil Field Hydrocarbon Systems. M. B. Standing. London: Chapman and Hall Ltd. Pp. 123 + vi. 80*s*.

The behaviour of an oil reservoir presents a problem of the greatest technical complexity. It is the business of the petroleum engineer to estimate the amount of oil in the reservoir and to suggest production methods likely to give the best economic recovery. To do this it is necessary to calculate the behaviour of at least two phases (gas and oil) and sometimes of a third (water) existing in the pores of the rock under pressures which may range up to 6000 p.s.i. The nature and distribution of the pore space can only be inferred for any given reservoir from measurements made on small samples of rock which may be brought to the surface when drilling wells, and it is necessary to deduce how representative the samples may have been from observations made on the reservoir itself during the course of producing oil from it. Each reservoir has its own particular problem, and it is rarely possible to use experience gathered on one to give a quantitative picture of another. In order to reduce the uncertainties in the calculation of the reservoir behaviour as far as possible, it is essential to make sure that all the data used are as accurate as they can be within the degree of practical operations. It is for this reason that a detailed knowledge of the physical behaviour of the reservoir fluids is of such great practical importance.

The volumetric and phase behaviour of the oil and gas can ideally be obtained by taking samples of the reservoir fluids and determining their properties in the laboratory. Such samples are difficult and expensive to obtain, and are not always

available. When they are lacking it may be possible on occasion to make a " mock-up " by retrieving samples of oil and gas at the wellhead and re-combining them, and this alternative is much used. But in many cases no good samples are available, and one can do no more than infer an analysis for the reservoir fluids and then make the best estimate one can of the physical behaviour. Finally, the knowledge of the behaviour of the fluids so obtained is used to predict what will happen inside the reservoir as oil is produced, that is to calculate a volume balance.

The techniques required for doing all these things are described in detail in this book, and as far as the writer is aware, have not been collected together before in a single volume. The basic physics of gas and oil mixtures is briefly discussed, and this is followed by a chapter on sampling. The next three chapters deal with the behaviour of gases and of liquids, and with vapour–liquid equilibria. These chapters enable one to calculate the essential physical data on the reservoir fluids from the information generally available. The two important types of reservoir, namely gas-condensate and dissolved gas, are considered in detail. The tests which should be made on whatever samples are available and the calculation of the behaviour of the hydrocarbon system from the results and from the data in the earlier chapters, are described in a straight-forward manner and illustrated by examples. The final chapter deals with material balance, and the methods advocated are illustrated by application to an existing reservoir.

Not all petroleum engineers will agree in detail with the correlations and methods presented by the author, many of which are based on his own work. These differences of opinion are not of fundamental importance, and the author's recommendation could be followed with confidence by the practising petroleum engineer. As a text-book the volume is to be highly recommended, and the student will be glad to keep it by him in after life, both to refresh his memory and for the sake of the data which it contains and which are frequently required in petroleum engineering calculations. Since a knowledge of the behaviour of hydrocarbon systems is of great importance not only to the petroleum engineer but also to the geologist, the latter will find a perusal of the book well worth while, particularly as it provides an unusually clear and concise discussion of this intricate subject.

The get-up of the book is in general good, but it would have been improved by a little more trouble in the presentation of the graphs. P. D.

Maleic Anhydride Derivatives. L. H. Flett and W. H. Gardner, New Products Division, National Aniline Division, Allied Chemical and Dye Corporation. New York : John Wiley and Sons, Inc., London : Chapman and Hall Ltd. Pp. 269. 52*s*.

To the majority of chemists, maleic anhydride is familiar chiefly on account of its ability to undergo a Diels–Alder condensation with conjugated diolefins, especially butadiene. It is, however, an extremely versatile compound which, because of the active grouping in its structure consisting of a carboxyl group attached to each end of an ethylenic linkage, can undergo a surprisingly large number and variety of reactions. The greater number of these involve the active double bond. During the last thirty years maleic anhydride has, owing to the ease with which it can be obtained by the oxidation of benzene, become an industrial chemical of considerable importance. Neither maleic acid nor the corresponding *trans*-isomer, fumaric acid, find any great application as such, although the use of maleic acid as a substitute for citric acid in soft drinks has been suggested. In the form of its anhydride, maleic acid is used for a wide variety of purposes, including certain alkyd resins, co-polymers, and maleinized oils. Less well known are its uses in producing surface active compounds, lub oil additives, pharmaceuticals, adhesives, rubber chemicals, cellophane, and so on. In these products maleic anhydride is employed as a basic or intermediate material for introducing the succinic acid structure.

The present work is not a text-book, nor is it intended to be complete or an exhaustive monograph. It has been written to acquaint research and industrial chemists with a number of typical reactions in which maleic anhydride may be employed and to give some idea of the uses in which its derivatives find application. It is well written, and will be a useful addition to the list of books on special subjects.

S. F. B.

The Petroleum Dictionary. Lalia Phipps Boone. Norman (Okla.) U.S.A.; University of Oklahoma Press, London: Bailey Bros. and Swinfen Ltd., 1952. Pp. 328 + xiii. 40*s*.

Many consider that the perpetuation of slang degrades a language, others that it enriches and revitalizes it.

Be that as it may, there is no doubt that the oil industry has made a large contribution to the colour and content of the English language, much larger than most of those who have never worked on oilfields can realize.

Dr Boone has compiled this dictionary from both the lively and picturesque slang words and expressions of oil workers, mainly in the fields of Oklahoma and Texas, and from the highly specialized technical terms relative to equipment and operations.

The first part of this book surveys the origins, development, and characteristics of the language of the oilfield, and is redolent of the turbulent and highly individualistic character of early oilfield workers. Living as they did (and still do) in secluded communities, they developed their own language for events, experiences or things which were completely new, and for which no precise terms were available.

These were largely based on giving a new meaning to an old word, or to twisting or compounding old words, seldom were new words developed (words such as "cracking" or "doctor" readily spring to the mind).

The second part of the book, the dictionary proper, gives definitions of over 6000 words and expressions, and is a joy to dig into. One learns of the irreverent terms for engineers ("brainstorm" or "educated gasser") and for geologist ("mud smeller" and "rock hound"), and of the incredible variety of synonyms for the Boss—including "Czar, Head Knocker, High Power, Kingfish, Pot Man, Spread Foreman"—surely not to be surpassed in any other industry or calling.

Many of the terms included are the product of human relationships and experiences outside work, among which may be mentioned those referring to food—"boarding house mystery" (hash), "cackle berry" (egg), and "mule skinners' delight" (macaroni). Others will revive memories of the history of that period with names or nicknames of some of the more notorious characters, and yet others reflect a somewhat Rabelaisian outlook on life perhaps not unknown to the oil industry.

The joy of lighting on terms such as "stinkum nasty" for mercaptan, or "goonspoon" for shovel, does tend to make the reviewer pass over with a tolerant eye the rather too frequent unintelligible, garbled, out-of-date or incorrect definitions of some of the technical terms. It is a pity for such a book to be spoiled by blemishes such as the definition of detergent and dispersant additives as "Chemicals that change the composition of petroleum by the addition of carbon."

In general, this book will undoubtedly bring pleasure to philologists and to all interested in the early history of the petroleum industry. It will also well serve its main purpose, that of a guide to the many incomprehensible terms in oilfield reports or literature likely to be encountered by the New Employee (see apple knocker, boll weevil, brake weight, bronc, cotton picker, green hand, oil Johnny, rookie).

C. L. G.

Methoden der Organischen Chemie (Houben-Weyl). Vol. 8, Oxygenated compounds. Ed. E. Müller, 4th Ed. (14 vols.), Stuttgart: Georg Thieme, 1952. Pp. 775 + xviii. DM 98.

The very name Houben-Weyl immediately brings to mind the universally accepted standard handbook of organic chemical methods. Many specialized and excellent books have appeared in the past years on particular subjects, but no one has even attempted to provide such a comprehensive treatise on methods of organic chemistry.

The last full edition appeared in the twenties, and has therefore long been obsolete. It is hardly adequate to call this a revised edition, only the principle remains, but the previous four volumes have grown to fourteen of seven hundred pages each, due to appear within the next four years.

Each chapter has been compiled by an expert, often an industrial chemist having access to the patent literature, industrial archives, and special libraries, which adds considerably to the completeness of references. It is also a great achievement to have covered the literature until one year or less before the date of publication.

The chapters of this first volume to appear are: 1. Peroxides; 2. Derivatives of carbonic acid; 3. Nitriles, *iso*nitriles, and fulminates; 4. Carboxylic acids and decarboxylation; 5. Esters of carboxylic acids; 6. Functional *N*-derivatives of the carboxylic group; author and subject indexes.

The first chapter, of particular interest to petroleum chemists, is written by R. Criegee, with a thoroughness no other review on peroxides has achieved.

Used in the proper spirit, this volume and those to follow should prove an invaluable source of fresh ideas to all petroleum chemists engaged in research and analysis. M. M. W.

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Oilfield Exploration and Exploitation

Geology

916. Use of thermoluminescence of limestones in subsurface stratigraphy. J. M. Parks, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 125–42.—The study of the thermoluminescence in the Meramecian and Chesteran series of limestones has led to the discovery that variations in radioactivity of the limestones appear to be the dominant factor in the cause of variations in thermoluminescence.

The preliminary work shows that thermoluminescence of limestones may have some usefulness in subsurface stratigraphy in identifying and characterizing a formation, helping to recognize tops and bottoms of limestone formations where there are no lithologic breaks, marking small units out of thick carbonate rock sequences for use in correlation, and recognizing erosion or non-deposition of zones by the absence of parts of the typical pattern of variation.

Methods of accurate quantitative measurement, as well as the apparatus used in measuring and recording thermoluminescence are also described in this paper.

E. N. T.

917. Thermoluminescence and surface correlation of limestones. D. F. Saunders. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 114–24.—The phenomenon of thermoluminescence is a natural property of the calcium and magnesium carbonate minerals of limestones. It is common to nearly all limestones when heated to a temp below that of incandescence, and can be artificially induced by irradiating the rocks with γ or X-rays.

The " glow curve " is the result of measurement of light emission by a photomultiplier tube circuit as the specimen's temp is increased; many of these " glow curves " have been measured, and the shapes of the curves have been found to be characteristic of the limestone stratum from which the specimens are obtained.

It is believed that further work on this problem will indicate that both " glow-curve " shape and amount of thermoluminescence may be used for correlation. E. N. T.

918. Dilatancy in migration and accumulation of oil in metamorphic rocks. D. A. McNaughton. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 217–31.—This paper is concerned primarily with the geological processes responsible for the migration and accumulation of oil in the basement rocks underlying five oilfields in Southern California.

The objective of the paper is to arouse interest in these unusual accumulations of oil and thus to foster discussion which may lead eventually to better understanding of the processes involved in their formation. It is suggested that the geological record can be improved by a critical examination of working hypotheses concerning the nature of the geological processes responsible for the formation of basement oil pools. Among these hypotheses is the generally accepted " up-slope " theory of oil migration in basement reservoirs. The theory is closely patterned after our working concept of migration of oil in conventional sandstone carrier beds. The theory and its limitations as a guide for exploratory work are discussed.

An alternative proposition is advanced that fracturing of competent basement rocks involves dilatancy, which, in turn, reduces hydrostatic pressures in focal areas of deformation. Pressure gradients are thereby established between the potential basement reservoir rocks and the overlying source and carrier beds containing oil, gas, and water. Thus, a tendency to " suck in " fluids into the basement rocks is established.

E. N. T.

919. Performance of fractured oil reservoirs. S. J. Pirson. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 232–44.—The author's hypotheses, given in this paper for the explanation of the low oil recoveries from fractured reservoirs, are intended to stimulate thinking, so that experiments may perhaps be designed for their verification and for finding some solution to increasing recovery from such fields. Various approaches to this problem are suggested, but they have not received as yet the sanction of field use.

E. N. T.

920. Fracture porosity in Gulf Coast. M. A. Hanna. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 266–81.—After reviewing fracture porosity in the Gulf Coast as a whole, the writer wonders if it does not play a greater part in production and reserves of oil and gas than has been generally thought. He feels chagrined that, of the many cores he has examined, percentage estimates of fracture porosity have not been made. Because of this, he states that he can cite only some of the general types of fracture porosity found in the area. E. N. T.

921. Fracturing in Spraberry reservoir, West Texas. W. M. Wilkinson. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 250–65.—The Spraberry trend is distributed throughout the main part of the Midland basin, a geological province of the Permian basin. The

major part of the trend extends north and south 150 mls and attains max width of nearly 75 mls.

The Spraberry formation of West Texas is developed in the lower Leonard of Middle Permian, restricted in most part to the Midland basin. The main producing structure is a fractured permeability trap on a homoclinal fold. This homogeneous mass is undifferentiated except where layers of sands, siltstones, shales, and limestones alternate. They are deposited in a deep basin under stagnant conditions, with hydrocarbons formed throughout the 1000 ft of sedimentary rocks.

Fractures were created by tensional forces after induration, probably during post-Leonard time. With storage of the oil reservoir in the sandstone matrix, the fractures serve as " feeder lines " to conduct the oil to the borehole. Without these fractures, commercial production would be from a seemingly " too-tight " reservoir rock.

E. N. T.

922. Formation waters in Southwest Louisiana. B. C. Timm and J. J. Maricelli. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 394–409.—The variation of the salinities of connate waters has been the subject of much past study and discussion. In Southwest Louisiana, a relationship is found between the salinity of connate waters and the facies changes of the sediments from which they are derived.

The geological setting of the area is discussed. Facies changes are important in determining the character and relative amounts of sand, shale, or limestone deposited. Seventy-two salinity determinations were made on waters from sixty-nine wells in twenty-nine oil or gas fields. From these data, it appears that the salinity of formation waters from sand bodies is a function of the quantity and degree of compaction of adjacent shales. E. N. T.

923. Geological aspects of abnormal reservoir pressures in Gulf Coast Louisiana. G. Dickinson. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 410–32.—Abnormal pressure has been defined as any pressure which exceeds the hydrostatic pressure of a column of water containing 80,000 parts per million total solids.

High-pressure zones commonly make drilling of wells most difficult in a belt about 50 miles wide along the coastal plain northwest of the Gulf of Mexico from the Rio Grande to the Mississippi Delta. This study is an attempt to link geological factors with occurrences of abnormal pressure in order to provide a better understanding of their origin.

The high pressures are caused by compaction of the shales under the wt of the overburden, which is equivalent to approx 1 psi/ft depth. E. N. T.

924. Jefferson Island salt dome, Iberia and Vermilion parishes, Louisiana. J. B. Wharton, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 433–43.—Jefferson Island, one of the famous " Five Islands " of the Louisiana Gulf Coastal area, is about 10 mls west of New Iberia in the southwestern part of Iberia and Vermilion parishes.

Recent drilling has added materially to the knowledge of the size and shape of the salt plug and the structure of the flank sediments, particularly on the east and southeast. It is the purpose of this paper to supplement the previous reports with this additional information and to draw such tentative conclusions as are warranted at this time.

E. N. T.

925. Williston basin—new province for oil exploration. T. R. Barnes. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 340–54.—The term " Williston basin " is used in this report to designate an area which extends over parts of the states of South Dakota, North Dakota, and Montana, and the provinces of Manitoba, Saskatchewan, and Alberta. The area of the Williston basin is approximately 240,000 sq mls, and it contains a Mesozoic section averaging 600 ft in thickness, with possibilities for oil and gas accumulation in at least six zones which have not been adequately explored, and a Paleozoic section of 5000–7000 ft in thickness, consisting for the most part of carbonates, with porosity varying from fractures, to intergranular and to vuggy. At the present time the principal objectives are in the Charles and Mission Canyon formations of Mississippian age, the Devonian, the Silurian, and the Ordovician. E. N. T.

926. Oil production from fractured pre-Cambrian basement rocks in Central Kansas. R. F. Walters. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 300–13.—Fractured pre-Cambrian basement rocks are the reservoir from which fifty or more widely scattered wells in Central Kansas produce oil. The reservoir rock in these fields is hard, granular, white quartzite. Little or no interstitial pore space is visible. Oil showings are difficult or impossible to detect in well cuttings. From this and other evidence, it is concluded that the commercial reservoirs consist of a reticulated fracture system in the brittle quartzite. No diamond cores are available.

It is the writer's opinion that the basement rocks have been inadequately tested in the past. Where encountered structurally (or topographically) high, the fractured pre-Cambrian basement rocks are worthy of careful consideration as a potential commercial oil reservoir. E. N. T.

927. Relationship of natural gas occurrence and production in Eastern Kentucky (Big Sandy gas field) to joints and fractures in Devonian bituminous shale. C. D. Hunter and D. M. Young. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 282–99.—During 1951, Kentucky produced 73½ billion cu. ft. of natural gas, of which 71½ billion cu. ft. came from the Big Sandy gas field of Eastern Kentucky. Here, the Devonian bituminous shale was the source of more than 70% of the total production. To date, this field has produced an estimated total of 1 trillion, 250 billion cu. ft. of gas, and the estimated remaining reserves for all Eastern Kentucky are 1 trillion, 400 billion cu. ft.

The Big Sandy gas field of Eastern Kentucky occupies a structural position on the east flank of the Cincinnati arch with regional dip (30 to 50 ft/ml) and thickening (350 to 750 ft) east and southeast.

Throughout the field, the Devonian bituminous shale is separated from the Sunbury Mississippian shale by the Berea–Bedford interval of shales, silts, and sandstones.

Gas occurs in the shale in two systems or magnitudes of porosity and permeability: (1) a minor consisting of silty and fine sandy zones in the shale, and (2) a major system provided by joints, fractures, and to a less extent, bedding planes. Accumulation in the latter system is the source of commercial production. E. N. T.

928. Fractured shale reservoirs of California. L. J. Regan, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 201–16.—The Santa Maria coastal district and the southwestern part of the San Joaquin valley are two areas where fractured sedimentary rocks form important oil reservoirs in California. It is estimated that fractured shale reservoirs, including chert in California, have yielded approximately 290,000,000 brl of oil, and substantial reserves remain. Initial production of individual wells is commonly between 200 and 1000 brl, and ranges upward to 2500 b.d. Individual cumulative production of some wells exceeds 1 million brl. Gravity of oil is mainly between 12° and 18°, but varies from 6·5° to 39°. Well depths range to 6500 ft or more, but are mainly between 4000 and 6000 ft.

This paper, which forms part of a symposium on fractured reservoirs, describes and illustrates the productive areas of the state and their lithology, with particular reference to the sedimentary history and mode of origin of the fractures. E. N. T.

929. Regional stratigraphic analysis of middle and upper marine Jurassic in Northern Rocky Mountains–Great Plains. G. T. Schmitt. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 355–93.—Marine Jurassic strata are widely distributed throughout Wyoming, Montana, adjoining parts of Idaho, Southern Alberta, Saskatchewan, and Manitoba, and western North and South Dakota. Except along the Rocky Mountain Front in Alberta, and throughout the southern part of Wyoming and Northern Utah, the area includes the present limits of known occurrence of Jurassic rocks.

In this paper tectonic and environmental conditions during Middle and Upper marine Jurassic time are reconstructed from isopach–lithofacies and paleogeologic maps. Clastic ratios and sand–shale ratios are used to define the lithologic variation.

The important tectonic elements which were active during Middle and Upper marine Jurassic sedimentation include: the arcuate Idaho–Utah basin centred in southeastern Idaho; Belt island of central and southwestern Montana; central Montana and Wyoming shelf area; and the basins in southern Saskatchewan and western North Dakota. E. N. T.

930. Sedimentary trends, Colorado member of Oficina formation, San Roque, Anzoategui, Venezuela. R. Passega. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 331–9.—The eastern Venezuelan geosyncline trends east between the Andes and the Guayana shield. In central Anzoategui, the most salient structural feature is the Anaco trend, a 40-ml-long anticlinal structure directed northeast on the southern limb of the geosyncline. At San Roque the oil is largely accumulated in sand lenses of the lowest member of the Oficina formation, which is called the Colorado.

In this paper a study of the sedimentary characteristics of the Colorado sands is presented. The study is limited to the Colorado in the San Roque area, but the conclusions can probably be extended to other members of the Oficina formation in the entire Anaco belt, and possibly of the Oficina formation in the highly productive Greater Oficina area 40 mls southeast of San Roque. E. N. T.

931. Oil prospects in Israel. M. W. and D. Ball. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1–113.—Israel has an area of 8040 sq mls. In this paper, a description is given of the eight geologic provinces which go to make up the country.

These provinces have many structural differences: the Dead Sea–Wadi Araba graben with faulted anticlines and half-anticlines along its borders and with possible salt domes in the valley itself; the Negev, striped with long anticlinal folds with many domes; the foothills belt, showing surface evidence of anticlinal folds oblique and parallel with the Judean–Ephraim arch; the anticlinal folding of the coastal plain; the Carmel uplift—a horst with two anticlines; the Emeq—a graben with the older rocks concealed beneath Recent and Pleistocene sediments with a few Miocene and perhaps Plio-Pleistocene volcanoes near the eastern end; the Upper Jordan rift valley; the northern extension of the Dead Sea–Wadi Araba graben; finally, the Galilee highland, a faulted area of tilted blocks, grabens, and horsts, with many faulted anticlines and half-anticlines.

Sedimentary beds range from early Paleozoic to Recent, and fall into three main divisions: (1) upper clastic, Recent through Oligocene, terrestrial with numerous marine members; (2) middle calcareous, Eocene through Upper Cretaceous, almost entirely marine; (3) pre-Upper Cretaceous, interfingering terrestrial sandstones and marine beds, with the marine percentage increasing northward and westward from about 15% in the southernmost Negev to 70% or more in the northwestern Negev, and thence northward.

Total sedimentary thickness is probably 3000 to 7500 ft in the southern Negev, 7500 to 12,000 ft in the northeastern Negev, and 10,000 to 20,000 ft in the northwestern Negev and the rest of the country.

After examination, the authors conclude that the oil prospects of only two of the provinces are obscure, the remainder having good prospects of oil and gas.

E. N. T.

Geophysics and Geochemical Prospecting

932. Application of neutron logging to petroleum exploitation. Z. Wierzbicka. *Nafta (Krakow)*, 1952, **8**, 90–5.—The paper summarizes theory and practice of neutron logging, and gives the constants affecting neutron absorption and dispersion. γ logging is briefly mentioned and considered less reliable. Three tables and two graphs in text.

M. S.

Drilling

933. Planning cuts mud costs. F. S. Bell. *World Oil*, 1.2.53, **136** (2), 134.—Substantial savings, in excess of 50%, have been effected by the closer co-operation of mud service engineers and drilling crews. Planning is an essential feature, and information from other zones assists in guarding against "lost circulation" zones. Much material can also be salvaged after operations at any one location. The Elk City field, West Oklahoma, gave rise to problems of penetration of salt formations, anhydrite, and lost circulation zones. Lost circulation has been minimized by reducing the rate of running of drill pipe and casing, and the pumping pressure over the particular zone. Two refs. A. J. H.

934. How to train mud engineers, Pt. 2. F. Chisolm and B. Q. Green. *World Oil*, 1.2.53, **136** (2), 125.—The techniques include: filtration tests by Fann and Baroid testers; pH determination, using *p*-hydrion paper and Beckman pH meter; sand content, the more widely used field test using screens; filtrate analysis, including alkalinity, brine content, chloride, calcium, for hardness, by soap and Versenate methods. Refs. A. J. H.

935. How they're whipping Williston's winter. L. W. Sveen. *World Oil*, 1.2.53, **136** (2), 120.—Winter operations are described with reference to location of equipment, most of which is totally enclosed, and the " Winterizing " of the derrick, or the closing of the three girts of the derrick and canvas protection for the derrick man. Steam and water lines are laid together to prevent freezing of the latter. With shallow wells, the mud pits are enclosed, whereas deeper formations provide enough heat to the mud to justify the external location of pits, and the minimizing of " mists " in the enclosed portion. Personnel welfare is important. A. J. H.

936. Running and pulling pipe under pressure. W. L. Long. *World Oil*, 1.2.53, **136** (2), 111.—In many cases running and pulling pipe under pressure has been regarded as the last resort in field operations, but in fact this method has much to commend it even in the case of work-over. The method obviates the use of heavy mud to kill the well. The principal advantages include: the elimination of the need for specialist equipment for mixing mud and of the cost of weighing material; a substantial decrease in lost time; the absence of any danger of damaging the productive formations by clogging. A typical operation is considered for a well of 10,000 ft depth and 2000 psi producing pressure. A. J. H.

937. Mud control in the fields of the Iraq Petroleum and associated companies. A. W. Paxton. *J. Inst. Petrol.*, 1953, **39**, 2–18.—The varying formations occurring in the oilfields of these companies are outlined. The preparation, maintenance, and control of drilling muds for use in such formations is discussed in relation to the suspensive ability and filtrate/viscosity properties of the muds. The limitations of bentonite, lime-base, and emulsion muds are contrasted and the factors influencing mud economy reviewed. A. R. W. B.

938. Pumping jacks (horses heads) and masts (derricks) for crude exploitation. S. Karlic. *Nafta* (*Krakow*), 1952, **8**, 136–9, 168–72. (*Petroleum News* Supp.) (*Paper read at Krakow Meeting of Rationalizers*, 18.12.51).—Author deals first with pumping wheel and rods and discusses stresses in them caused by horses heads of different designs. In second part he expresses himself in favour of transportable derricks. Two kinds are needed in industry, capable of lifting 18 and 30 tons, respectively. M. S.

939. Core-sampling in percussion drilling. K. Wojnar. *Nafta* (*Krakow*), 1952, **8**, 118–20.—Author describes early German, Polish, and Soviet coring bits with detailed diagrams. Their performance varied from cores of 1 inch dia, 0·5 m long, in the German model of 1906, through 1- to 1·5-m-long cores of 6 cm dia in 1930, Polish model, to 4·5 m long, 11 cm dia cores taken by Kariagin's type of coring bit. Smaller hand operated bit gives cores *ca* 1·5 m long, 69 mm dia, from shallow drillings. M. S.

940. Science and technique in Soviet Union. Preventive and combative action in cases of seizure and breakage of drilling tool or string in small diameter coring. R. Piatkowski. *Nafta* (*Krakow*), 1952, **8**, 102–4, 128–32, 159–60, 190–2, 219–21.—Breakdowns in which the string is caught in the well whether it shears or not cause a great loss of time and money. There can be seven main kinds of such breakdowns, *i.e.*: (1) fracture of mud-carrying pipes, (2) breaking off of coring pipe (sampler), (3) fracture of the bit, (4) seizure of bit, (5) seizure of drilling string, (6) collapse of well walls, and (7) fracture of casing. Each case is mentioned and instructions given for its prevention. Next follows a list of extracting tools, including tapered screws, cones, expanding internal gripping device, hydraulic pipe knives, especially hard drilling bits, pile drivers, rescue screws for pulling out string, and others. It is required to determine the exact position and nature of breakdown and to remove it. Instances of procedure are given for all cases. M. S.

941. Problem of equipment uniformity in petroleum drilling. W. Kulczycki. *Nafta (Krakow)*, 1952, **8**, 121–5.—To point direction to technical progress, the author gives details of Soviet regulations from 1.1.47. They reduced types of drill holes to 329 and derricks to sixty-four kinds. Mention is made of types of roads, pipelines and mains, electric supply, and exploitation equipment permitted by the regulations. M. S.

942. Patents. U.S.P. 2,604,447 (29.7.48; 22.7.52.) G. W. Cummer and D. H. Larsen, assrs to National Lead Co. Aq well-drilling fluid containing sufficient of a modified starch-dextrine, produced by heating starch at 220° to 250° C for *ca* 15 min, to attain a low water loss.

U.S.P. 2,604,448 (23.2.49; 22.7.52). D. L. Wilson, assr to Oil Base Inc. Visc and gel strength of oil-base drilling fluids is reduced by incorporating a terpene, terpene alcohol, terpene ketone, or terpene ether (0·05 to 10%).

U.S.P. 2,603,598 (1.4.50; 15.7.52). V. G. Meadors, assr to Standard Oil Development Co. Drilling fluid comprising aq clay suspension and sufficient $C_{2\text{-}15}$ alkanolamine having $\geq$3C between OH and amino group to give pH of $<$10.

U.S.P. 2,605,222 (Neth. 14.12.48; 29.7.52). G. K. Jones, assr to Shell Development Co. Oil base drilling fluid containing a non-oxidized, non-sulphurized, polymerized asphaltic bitumen.

U.S.P. 2,604,779 (11.5.48; 29.7.52). W. R. Purcell, assr to Shell Development Co. Pressure apparatus for measuring capillary pressure of porous bodies (drill cuttings) by forcing a liq (mercury) thereinto. V. P. P.

Production

943. Fracture-controlled production in Gilbertown field, Alabama. J. Braunstein. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 245–9.—The discovery well location in this field was made on the basis of a seismic survey carried out along a long-known surface fault system. The presence of an east–west striking gravity min associated with the structure suggests it may have been formed as a salt ridge. The strike faults, downthrown on the north, which control production, extend west of the field to the Mississippi line, and east of the field into Clarke County, Alabama.

Most of the oil produced in the field comes from sands of Upper Cretaceous, Austin age, of the Eutaw formation, in narrow belts of closure along the upthrown side of the faults.

Cumulative production in the Gilbertown field to Dec. 1951 was 3,635,000 brl. Estimated ultimate recovery is approximately 5 million brl. E. N. T.

944. Permeability determined from production data. D. Cornell. *World Oil*, 1.2.53, **136** (2), 186.—A method is outlined whereby a knowledge of the properties of the gas at reservoir conditions, the thickness of the producing formations, rate of production, and the decline of bottom hole pressure with time, permits the estimation of the permeability of a natural gas producing formation. A specimen calculation is taken. Three refs. A. J. H.

945. Dual completion takes two full size tubing strings. R. W. Reiss and J. E. Kastrop. *World Oil*, 1.2.53, **136** (2), 162.—The principle of dual completion has long been applied, but in offshore locations the hazards associated with damaged well-heads have not encouraged this method of completion. In general, in offshore dual completions it is advisable to be able to handle both zones independently, so that either zone may be swabbed, and with the installation of storm chokes, loss of control is obviated; also, mud is usually left in the casing annulus. The method is fully described for running two parallel strings which are quite independent and lend themselves particularly to offshore installation. It could conveniently be applied to the production of corrosive crude in conventional wells, where it is advisable not to allow the crude to be in contact with the casing. Diagrams. A. J. H.

946. In drill stem testing subsurface pressures tell story. C. C. Olson. *World Oil*, 1.2.53, **136** (2), 155.—A thorough basic knowledge of drill tool is required before being able to interpret subsurface record charts with any confidence. The hole must first

be cleared of tight-spots and cuttings, and mud conditioned. Faithful reproduction of the charts may then yield valuable information. Fourteen such charts are reproduced, and their main features explained. The initial calibration of the instruments is described. A. J. H.

947. Tasks of Polish petroleum industry for the third year of 6-year plan. S. Laskowski. *Nafta* (*Krakow*), 1952, **8**, 111–12 (*Petroleum News* Supp.).—The plans for 1952 are characterized by further change-over from percussion to rotary drilling. Rotary drilling is to go up nearly sixfold in exploitation, up by 50% in search for oil, and also rise in other geological ventures, whilst percussion drilling is to go down. Efficiency of both kinds is to be raised by 78% and 25% respectively. Production of crude, natural gas, and gasoline is also to increase. M. S.

948. Petroleum drilling and exploitation in Sanok district in the struggle for completion of plans. J. Sobillo. *Nafta* (*Krakow*), 1952, **8**, 134–6 (*Petroleum News* Supp.).—Author gives a summary of production results compared with previous years and with the rest of the country. Time saving was achieved due to time-and-motion study introduced into industry. Rationalization movement and employees' inventions account for drop in level of own costs by 16·8% since 1949. M. S.

Oilfield Development

949. Polish petroleum industry in 1951 and its guiding principles for 1952. J. Drzewiecki. *Nafta* (*Krakow*), 1952, **8**, 105–8 (*Petroleum News* Supp.) (*From paper read at National Petroleum Conf. at Krosno*, 29.2.52).—In 1951 the following increases were recorded: crude production, 8·4%; refining, 46·0%; production of natural gas, 51·7%; production of petrol, 9·3%; depth drilled, 20·5%; production per worker, 50·6%. For 1952, plans include the following increases: production of crude (including repressurizing), 22·5%; drilling, 27%. The plans involve 32% increase in rotary drilling and 41% fall in percussion drilling whilst increasing efficiency of each unit by *ca* 20%. Other objectives were: better utilization of wet natural gases; establishment of reserves of crude in refineries; and better distribution of products. 1952 is the third year of the six-year plan. Graph on cover. M. S.

Transport and Storage

950. Progress in products pipeline. S. S. Smith. *World Oil*, 1.2.53, **136** (2), 201 (*32nd Annual Meeting, API Chicago, Nov.* 1952.)—A review of progress in pipeline technology is given. Features of this advance include: remote gauging systems of particular importance to products despatch; the cut-down in overlap normally obtained when pumping batches along pipeline, in some cases using mechanical means (the terminal layouts for their use are illustrated); the use of a measured mile of known capacity in cutting down metering delays; and the co-ordination of this metering method with the separation of the line products into distinct batches. A. J. H.

951. Humble's pipeline network serves Texas and New Mexico. Anon. *World Oil*, 1.2.53, **136** (2), 214.—A review of Humble operations, accompanied by a map of the Humble Pipe Line Co. operations. A. J. H.

952. Considerations regarding a trans-European pipeline. A. Günther. *Erdöl u. Kohle*, 1953, **6**, 41–3.—Criticism of proposals previously made (cf. Abs. 1364 of 1952). Economics of trans-Arabian line are favoured by avoidance of Suez Canal dues, and hence cannot be used as basis for assessing trans-European line. Cost comparison indicates that tanker transport is cheaper for points north of approximately Paris area; pipeline is, however, a better risk in war, and could be laid as a standby, southerly portion being operated and northerly on a maintenance basis pending an emergency. A reply to these criticisms by the original author is given. V. B.

953. Engineering factors in selecting floating roofs. J. H. Wiggins. *Petrol. Engr*, 1952, **24** (13), C13–16.—The development of floating roofs for tanks storing volatile liq is traced, and the required spec are listed. The importance is shown of: (*a*) secondary seals for conditions of pulsation due to wind, and (*b*) painting of tank and roof in white to reduce solar heat transfer and prevent corrosion. E. K. J.

954. Underground storage of gasoline. P. W. Sherwood. *Chim. et Industr.*, 1953, **69**, 147–9.—Rising steel costs increase attractiveness of underground storage. Caverns formed by dissolution of salt deposits are the most suitable, and pet fraction can be displaced therefrom by sat brine. Whilst concrete lining is expensive (*ca* $2 per brl), it can be restricted to blockage of cracks, but concrete itself has appreciable permeability, and a better lining is a thiokol-based latex. For gasoline storage, capacity of 60,000 cu. ft. is recommended. Swedish experience with the Edholm system has been promising, a 1 million brl storage of fuel over three years having been trouble-free. Cost for salt caverns is $0.75 per brl and for excavations $4.50, but in each case steel requirement is only about 2 lb/brl. Whilst excavated storage shows no cost advantage over surface storage, benefit is gained from reduced evap loss. V. B.

955. The centrifugal compressor. C. F. Koenig. *Oil Gas J.*, 2.2.53, **51** (39), 93.—In this issue of the Engineering Reference Section more is given on compressor station operation, and charts show station operation at discharge pressures of 600, 700, and 800 p.s.i.g. G. A. C.

956. Large-diameter line pipe. W. C. Hoppe. *Mech. Engng*, 1953, **75** (2), 114.—Production and applications of expanded steel pipe, 8⅝ to 36 inches dia are described. The pipe is fabricated from flat steel plate, the sequence of fabrication being: plate trimming, forming into tubes, flash resistance welding, expanding, end-facing and bevelling, testing, and inspection. The pipe is expanded in cylindrical dies, the finished product being within close tolerances for straightness, circularity, and size. Expansion of the pipe results in an increase of circumferential yield strength from 44,000 to 52,000 psi, with consequent saving in material. T. T.

957. Gas turbines and centrifugal compressors. T. R. Rhea and J. S. Quill. *Oil Gas J.*, 9.2.53, **51** (40), 133; 16.2.53, **51** (41), 169.—Pt. 1 of this series in the Engineering Reference Section deals with application of gas turbines to natural gas pipelines, and a figure illustrates the economics of short station spacing on the El Paso Natural Gas system, which uses twenty-eight turbines.

Pt. 2 of the series deals with centrifugal compressor flexibility in meeting the varying flow and pressure conditions in a pipeline. A chart shows compressor and pipeline characteristics superimposed. G. A. C.

958. Patent. U.S.P. 2,603,804 (7.1.50; 22.7.52). H. L. Bilhartz, H. E. Greenwell, and L. E. Davis, assrs to Atlantic Refining Co. Plug for removing paraffin accumulating in oil conduits, including an oil-soluble base material and a rosin amine salt of an organic acid. V. P. P.

Refinery Operations

Refineries and Auxiliary Refinery Plant

959. Modernized motor oil facilities. H. F. Nolting and R. B. Selund. *Petrol. Process.*, 1953, **8** (1), 76–80.—Reduced Mid-Continent sweet crude is the charge stock used to produce 2000 bsd of motor oils at the Whiting refinery of the Standard Oil Co. (Ind. U.S.). The new facilities available for the manufacture of the oils include solvent extraction and acid treating in propane solution. Descriptions and performance details are given of the units on stream.

Reduced crude (atm dist tower), and steam enters the vac tower from the pipe stills at 750° F; the residuum is steam stripped in the bottom four trays of this tower, while the vapours are fractionated into three motor oil side steams and an overhead stream, which is light paraffin distillate. The phenol extraction unit removes low V.I. com-

ponents from the vac pipe still distillate. The propane dewaxing and finishing plant performs three separate functions; dewaxing, acid treating, and clay contacting. Performance data for both these units are given in tabular form. A motor oil blending plant is also in use; this compounds the motor oil into finished product for shipment.
J. W. H.

960. One approach to automatic process control. Anon. *Petrol. Process.*, 1953, **8** (1), 72–5. (*Condensed from an article read before Amer. Soc. Mech. Engrs. N.Y., Dec. 1952, by M. V. Long and E. G. Holzmann*).—Computor control of plant and equipment in the automatic factory is expected in the future. The primary function of this type of controller is to collect all the available plant operating data, to substitute them in physical and chemical equations, and to solve the equation in accordance with predetermined performance criteria. The computer controller will be an aid to, rather than a substitute for, the human operator. The controller would automatically adjust operating conditions according to the load, and would actuate warnings directly to the operator when these conditions exceeded normal limits.

Formidable obstacles are yet to be overcome before the computer controller comes into general use; one of these is the question of the reliability of equipment.

Correlation, or operational analysis, is another approach to automatic control that may be employed. This could be accomplished by the use of modern high speed calculation devices and techniques.

Sets of typical field tests on pneumatic speed control systems are given, and the use of frequency response tests is discussed. J. W. H.

961. 385,821 b.d. new capacity in '53. Anon. *Petrol. Process.*, 1953, **8** (1), 53–4.—The results of a survey, recently released by the Petroleum Administration for Defence in the U.S., show that an increase of 5% is expected over the present crude charging capacity of 7,770,560 bd by the end of 1953. Cat cracking charge capacity and cat reforming capacity will be increased by 13·7% and 75·9% respectively.

Summaries are given of the present and anticipated capacities in the future for all the major U.S. refineries. J. W. H.

962. High-pressure instrumentation. P. W. Bridgman. *Mech. Engng*, 1953, **75** (2), 111.—Early difficulties peculiar to the high-pressure field have been overcome, and experiments at pressures exceeding 30,000 atm are possible. Pressures of 100,000 atm have been achieved, using a carboloy pressure vessel, and the author suggests that higher pressures can be reached using a nest of pressure vessels with progressive increase of pressure from the outermost vessel to the innermost. Phenomena at high pressures and some aspects of measuring high pressures are discussed. T. T.

963. Refinery construction in Canada. Anon. *Petroleum, Lond.*, 1953, **16** (2), 35–9.—A description of the $23 million refinery at Sarnia, Ontario, owned by Canadian Oil Cos. Ltd., which went on stream in Sept. 1952. Crude is obtained from the Redwater oilfields of Alberta via the Interprovincial pipeline to Superior, Wisconsin, and thence by tanker across the Great Lakes. Waterfront facilities include two docks, one for unloading crude (to operate at a max of 15,000 brl/hr) and another for shipping finished products. Floating-roof steel storage tanks (38 million gal) are provided for winter storage when lake navigation is closed.

The refinery produces butylene for the adjacent plant of the Polymer Corpn and feedstock for pet chemicals for the neighbouring Dow Chemical Co. of Canada Ltd., as well as aviation gasoline, kerosine, jet fuels, premium and regular gasoline, diesel fuel and stove oils, propane, and sales gas.

Main process plants are: crude distillation unit (chemical desalting, crude preflashing, atmospheric dist, vac dist); vis-breaking unit; the platforming unit (more than 4000 b.d.; a Girbotol unit strips all hydrogen sulphide from effluent gas stream); the cat cracking unit (Kellogg fluid *Orthoflow* type) and the cat polymerization unit.

Blending and loading, steam and water supplies, waste dispersal, plant safety devices, pump house, and laboratory are all briefly described. R. E. P.

964. Processing Australian shale oil. E. G. Nottes. *Petrol. Engr*, 1952, **24** (13), C22–30.—The production of gasoline, fuel oil, and coke from Australian crude shale oils at Glen Davis, N.S.W., is described, together with the production of cresylic acids, pro-

pane, and butane as by-products. Yields of cracked gasoline are less than from pet crudes, due to the chemical composition of the shale oil and its content of S, N, and O compounds. The manufacture of surface active compounds, weed killers, lubricants, chemicals, and asphalt has been carried out on a pilot plant scale, and is a possible method for economic operation of the process. E. K. J.

965. New jet exchanger cleaning method. A. L. Foster. *Petrol. Engr*, 1952, **24** (13), C32–6.—The Hydroblast method of cleaning heat exchanger tube bundles uses a water sand blast and operates inside a compartment where the action of cleaning jets can be controlled. Comparative heat transfer ratings for bundles cleaned by mechanical, chemical, and Hydroblast methods show the advantage of the latter method. Labour requirement is reduced by at least one-sixth. E. K. J.

966. Reconstruction and expansion of German refineries. DEA refinery Heide. F. Staiger. *Erdöl u. Kohle*, 1953, **6**, 17–21.—After almost complete destruction in war, this plant, situated close to Heide field, was restored to 150,000 tons/year topping/vac dist capacity by 1951. Lub fractions are refined at company's Grasbrook (Hamburg) plant (formerly Schliemann), where dewaxing and Edeleanu facilities are available and speciality production (transformer and white oils) is carried out. In Sept. 1952 a 300,000-ton/year TCC unit was put on stream yielding 50% gasoline, 16% diesel fuel, 4% LPG, 22% fuel, 4% gas, 3% coke. Flow-sheet and detailed plant description given. Cracked gasoline has 71 O.N. (Motor), polymer gasoline 85 O.N., ratio of yields is 9/1, giving 75 O.N. product (81 O.N. Research). Cost of cracker, including ancillary plant, was 25 million DM. Refinery operates almost entirely on Heide crude, difference between field output and refinery capacity being made good by imports, which are decreasing. V. B.

967. High temperature service. R. M. Braca and R. Merims. *Chem. Engng*, 1953, **60** (2), 165–71.—A comprehensive survey made by a leading design firm, covering the selection of materials and the design of equipment for high temp processes, such as cat cracking and reforming. D. M.

968. Pipe and tubing forgings. Anon. *Oil Gas J.*, 9.2.53, **51** (40), 141.—This number of the Refiner's Notebook gives Pt 2 on alloy steels for refining, and lists them for piping and forgings. G. A. C.

969. Engine cooling by ebullition. O. B. Freeman. *Oil Gas J.*, 23.2.53, **51** (42), 172.—Heat transfer to boiling water system of engine cooling is described and advantages outlined. An increase in thermal efficiency of 40% in the form of waste-heat recovered steam from compressors is noted. Considerable saving in operating costs is claimed. G. A. C.

970. The care and maintenance of hydraulic oil. J. R. Fawcett. *Mech. World*, 1953, **133** (3403), 66.—The importance of the use of uncontaminated oils in hydraulic machinery is stressed. Troubles caused by overheating of oil and methods of ensuring optimum working temp are discussed. Edge-type, magnetic, streamline, and batch type waste oil filters are described. Line diagrams of various systems are given. T. T.

971. Experimental study of fluidized solid-gas systems. J. Martin. *Chim. et Industr.*, 1953, **69**, 57–71.—Laboratory test equipment for investigating properties of fluidized systems is described and illustrated. Two columns were used, dia 44 and 88 mm, test materials were sand (d 2·6, rounded particles) and coke (d 1·6, angular particles) each in four grades (in μ, 215 to 147; 147 to 110; 110 to 74; 74 to 50). Fluidizing gas was air at room temp. Results expressed by plotting pressure loss through column against rate of gas flow. Shape of curves for sand and coke is similar, linear rise being followed by irregular portion followed by horizontal course of curve when fluidized state has been attained. Slope of linear section increases with decreasing particle size, min speed of fluidization also decreasing therewith. Effect of varying bed ht and column dia shows min rate of fluidization increases with former and, for same ht of bed, with column dia. Increased bed ht and gas speed favour slugging, which is also facilitated by increasing particle size. For gas speeds 10 cm/sec, ratio bed ht/column

dia can be as high as 5, increasing to 10 if gas speed is halved. Lab use of 5-cm-dia columns gives results which are applicable on plant scale. Use of Leva's equation (*cf.* Abs. 438 of 1949) for calculation of shape factor of particles was justified by experimental results. Method of calculating min fluidization velocity is given and agrees to 10% with experimental results, but a greater gas speed (in some cases by as much as a factor of 50) is required to ensure total fluidization of the solid. V. B.

972. Double-duty gas plant. A. E. Kelley and H. F. Poll. *Petrol. Process.*, 1953, **8**, 1, 55–9.—The unusual features of a fluid cat cracking unit, recently placed on stream in Los Angeles by the Union Oil Co. of California, are discussed. These include the integration of gas recovery facilities for the new plant with those of an existing unit, the installation of a satisfactory pressure control system, and a wash-water system designed to eliminate hydrogen embrittlement and blistering problems in the gas plant equipment.

The new 28,500-bd Fluid Unit more than doubles the production of total cat gasoline in the refinery.

Details and flow diagrams are given for the combined gas plant, together with the operating difficulties experienced. J. W. H.

973. Gas turbines and centrifugal compressors. T. B. Rhea and J. S. Quill. *Oil Gas J.*, 23.2.53, **51** (42), 197; 2.3.53, **51** (43), 91.—This part of the Engineering Reference Section gives figures showing centrifugal-compressor and pipeline characteristics superimposed, and flow *v* C.R. to fully load one or two 5000-hp gas turbines to aid in selecting turbines and compressors.

A brief description of a gas turbine is given, and reference made to starting, flat characteristics, and adjustable nozzles. G. A. C.

974. Heating tube failures—1. J. J. B. Rutherford. *Oil Gas J.*, 2.3.53, **51** (43), 97.—The first of a new series in the Refiner's Notebook deals with specifications in furnace design. Carbon steel tubes, wall-thickness, and high-temp data are discussed. G. A. C.

975. Heating tube failures—cause and prevention. J. J. B. Rutherford. *Petrol. Process.*, 1953, **8** (1), 162–9.—Heating tube failures can generally be associated with one of the following three broad classifications: wrong material selection, fabrication defects, and overheating. Many of the metallurgical causes of failure in heater tubes have been dealt with in other papers by the author, and the emphasis is therefore laid in this article on overheating, and mechanical and chemical causes.

The wall thickness of the heating tube determines its heat transfer rate and its cost. In one case a tube lost as much as $\frac{1}{8}$–$\frac{1}{4}$ inch thickness from its wall mainly as a result of mechanical cleaning. ($5 \times \frac{5}{8}$ inch wall still tube carrying oil at 1000 psi at 1020° F, after eleven years use.) Many other failures due to mechanical causes result from the localization of stresses, although at high temp the distribution of stress is different.

The major cause of chemical attack on steel tubes at elevated temp is oxidn. Heater tubes suffer oxidn at the outer surface from exposure to combustion gases, and at the inside surface suffer carburization due to the coking of the oil.

Metal waste can occur from causes other than oxidn; any reaction which converts the metal into a salt contributes to attrition. Sulphur attack of heater tubes is also quite common owing to the presence of H_2S in the furnace gases.

Many examples of heating tube failures are given, and the effect of the addition of alloying elements to steel is discussed. J. W. H.

976. Heat transfer. B. E. Lauer. *Oil Gas J.*, 2.2.53, **51** (39), 103; 9.2.53, **51** (40), 139; 16.2.53, **51** (41), 178; 23.2.53, **51** (42), 203.—Pt 22 of the series continues with coeffs of heat transfer through film between inside of warm tube and cool gas.

Pt 23 of the series continues with coeff of heat transfer through film between the inside of warm tube and cool liquid.

Pt 24 continues with coeffs of heat transfer through film between outside surface of a cool tube and warm gas or liquid.

Pt 25 continues with coeff of heat transfer through film between outside surface of a cool tube and warm gas or liquid. G. A. C.

977. Alloy steels for oil refining. Anon. *Oil Gas J.*, 2.2.53, **51** (39), 95; 16.2.53, **51** (41), 173; 23.2.53, **51** (42), 799.—This number of the Refiner's Notebook commences a series dealing with specific recommendations for ferritic alloy steel used primarily in pipe, tubing, valves, and other fittings on a refinery.

Cast alloy steels for pressure vessels, catalytic cracking, and reforming processes are discussed and listed.

API Committee recommendations to the U.S. Petroleum Administration for Defense, to effect conservation of critical alloys are listed, and apply to the allocation of alloy steels for use in oil refineries. G. A. C.

978. Patents. U.S.P. 2,606,513 (12.5.44; 12.8.52). J. T. Bailey, assr to Phillips Petroleum Co. Furnace bridge wall cooling and air feeding construction.

U.S.P. 2,606,535 (14.3.46; 12.8.52). N. G. Sandstrom, assr to Eric City Iron Works. Boiler.

U.S.P. 2,606,536 (23.4.47; 12.8.52). F. O. Hess and K. W. Fleischer, assrs to Selac Corpn of America. Heater for heating a fluid flowing through a tube bank.

U.S.P. 2,606,628 (25.10.47; 12.8.52). C. F. Hasselwander. Filter.

U.S.P. 2,606,821 (24.2.47; 12.8.52). F. W. Harris, assr to Wulff Process Co. Furnace.

U.S.P. 2,607,438 (30.6.48; 19.8.52). B. E. Bailey, assr to Standard Oil Development Co. Cyclone separation for separating finely divided solid particles from gaseous fluids.

U.S.P. 2,607,439 (28.7.48; 19.8.52). S. P. Dickens, C. A. Coghlan, and P. G. Morrow, assrs to The Texas Co. Separation and concn of mixed gases of different mol wt.

U.S.P. 2,607,440 (21.10.47; 19.8.52). W. K. Lewis, assr to Standard Oil Development Co. Recovering condensible material from gaseous streams using fluidized solid technique.

U.S.P. 2,607,492 (27.1.49; 19.8.52). H. S. Anders, assr to Standard Oil Development Co. Apparatus for removing iron impurities from fluid streams utilizing a magnetic field.

U.S.P. 2,607,567 (31.7.40; 19.8.52). L. C. Hobbs. Heat exchanger.

U.S.P. 2,607,663 (25.7.47; 19.8.52). W. A. Perry and D. R. Merrill, assrs to Rohm & Haas Co. Catalyst unit comprising a plurality of catalytically active metal gauzes in intimate contact, joined at their points of contact by welding to form a pack, and a frame of thin sheet metal around the periphery of the pack, the frame having, intermediately at its edges, downwardly and upwardly extending elements, which form a groove and being adapted to serve as means for mounting the catalyst unit in a reaction chamber and forming a gas-tight seal between the walls of the reaction chamber and the said unit.

U.S.P. 2,608,210 (30.8.48; 26.8.52). T. A. St. Clair, assr to Phillips Petroleum Co. Relief valve.

U.S.P. 2,608,300 (3.7.48; 26.8.52). W. O. Small, assr to Standard Oil Development Co. Floating liq–liq separator. J. M. S.

Distillation

979. Salt effect in vapour–liquid equilibria; ethanol–water saturated with inorganic salts. R. R. Turse and A. R. Thompson. *Chem. Engng Progr.*, 1951, **47** (6), 304–8.—Work reported in a previous paper (*cf* Abs. 1222 of 1950) on the effect of dissolved salts on the vapour–liquid equilibrium of a binary system has been continued. Saturated solutions of sodium sulphate, potassium sulphate, and potassium nitrate were used in an Othmer type equilibrium still. Calculated values of relative volatilities and activity coeffs are presented, and a correlation expressing increased ease of separation as a function of salt solubility is developed. The Van Laar equations proved to fit the data for the ethanol–water–sodium sulphate system more closely than the Margules equations. J. G. H.

980. Patents. U.S.P. 2,602,046 (8.6.45; 1.7.52). W. J. Podbielniak, assr of one-half to W. G. Podbielniak. Column for precise fractionation which has a reflux condensing zone including a varying min temp point of condensation containing ≤ 3 spaced independent thermocouples whose temp are successively and cyclically recorded.

U.S.P. 2,602,093 (26.12.50; 1.7.52). M. R. Cines, assr to Phillips Petroleum Co. MeSEt is separated from *n*-hexane by dist overhead with perfluoromethyl*cyclo*hexane.

U.S.P. 2,605,216 (15.4.44; 29.7.52). D. E. Adelson and T. W. Evans, assrs to Shell Development Co. Separating an azeotropic mixture of a $\beta\gamma$-olefinic alcohol ($C_{>6}$)*A* and its saturated monocarboxylic acid ester ($C_{>13}$)*B*, *e.g.*, allyl alcohol and acetate, by first dist with an azeotrope former *C* (benzene) to leave pure *B* as residue. The *A* + *C* azeotrope obtained as dist is dist with water to leave pure *A* as residue and the dist allowed to stratify into two layers, the more aq layer being returned to the second dist and the other layer to the first dist.

U.S.P. 2,604,439 (26.11.49; 22.7.52). A. C. Nixon, assr to Shell Development Co. A C_4 2-alkenyl chloride (methallyl chloride) is separated from close boiling 1-alkenyl chlorides (*iso*crotyl chloride) by dist in presence of acetone. V. P. P.

U.S.P. 2,606,146 (26.6.48; 5.8.52). D. B. Luten, assr to Shell Development Co. High-vac multi-stage dist apparatus.

U.S.P. 2,607,719 (15.4.49; 19.8.52). T. Q. Eliot, C. S. Goddin, and J. C. Weaver, assrs to Stanolind Oil and Gas Co. Extractive dist process for separating butyraldehyde and ethyl acetate from aq mixtures containing also methyl ethyl ketone.

U.S.P. 2,607,720 (1.7.48; 19.8.52). W. E. Elwell and H. L. Childress, assrs to California Research Corpn. Separating mixtures of ethyl xylene, vinyl xylene, and higher boiling products by a two-stage steam dist in presence of sulphur.

U.S.P. 2,608,070 (20.2.46; 26.8.52). P. L. Kapitza. Fractional dist at low temp.

U.S.P. 2,608,387 (U.K. 19.2.47; 26.8.52). D. G. Randall. Fractional dist apparatus.

U.S.P. 2,608,397 (Neth. 28.7.48; 26.8.52). J. P. Treub, assr to N. V. Vereenigde Stearine Kaarsen-fabrieken "Gouda-Apollo." Fractional dist column. J. M. S.

Ger.P. 855,691, 18.9.52. K. Sondermann, assr to Metallges. A.G. Process and installation for dist, especially of high-boiling liq.

Ger.P. 855,692, 18.9.52. A. Milbers, K. Sondermann, and U. Untermann, assrs to Metallges. A.G. Process and installation for fractional dist of material mixtures.

Ger.P. 856,140, 18.9.52. E. Siebert, assr to Metallges. A.G. Arrangement of the passages in bubble cap edges of bubble column plates.

Ger.P. 855,098, 11.9.52. K. H. Eisenlohr, R. Jauernik, and H. U. Kohrt, assrs to Metallges. A.G. Process and installation for continuous countercurrent extraction of liq with liq.

Ger.P. 856,028, 18.8.52. B. Telgmann. Process and plant for recovery and fractionation of by-products from coal and gases.
BrennstChemie, 1952, **33** (19–20). R. T.

Absorption and Adsorption

981. Patents. U.S.P. 2,606,938 (6.7.48; 12.8.52). S. P. Robinson, assr to Phillips Petroleum Co. Continuous separation of unsaturated hydrocarbons containing not more than five carbon atoms from a gaseous mixture containing them, using a solid cuprous halide absorbent.

U.S.P. 2,608,270 (1.7.50; 26.8.52). D. T. McDonald and T. H. King, assrs to Socony-Vacuum Oil Co. Separation of light hydrocarbons from high-pressure gas.

U.S.P. 2,608,516 (4.1.49; 26.8.52). A. J. Miller, assr to Phillips Petroleum Co. Process of treating raw, wet, natural gas to transfer the propane and heavier constituents from a low pressure gas stream to a high pressure gas stream using three absorption steps. J. M. S.

Ger.P. 854,497, 4.9.52. F. Schytil and H. Krollmann, assr to Metallges. A.G. Process for separating droplets from gases and vapours.

Ger.P. 855,698, 18.9.52. H. Grothe. Process for recovering volatile materials from gases.

Ger.P. 854,949, 4.9.52. O. Moldenhauer, assr to Phrix-Werke A.G. Process for separating phenols and similar acid compounds from mixtures of high-mol alcohols and ketones containing them.

Ger.P. 855,444, 11.9.52. L. Mannes and J. Dresen, assrs to Henkel & Cie G.m.b.H. Process for separating straight and branched chain high-mol fatty acids from their mixtures.

BrennstChemie, 1952, **33** (19–20). R. T.

Solvent Extraction and Dewaxing

982. Patents. U.S.P. 2,605,211 (26.11.49; 29.7.52). J. F. Deters, assr to Standard Oil Development Co. Recovery of $SbCl_3$ from a hydrocarbon extract phase by adding 10 to 45% of benzene, based on wt of $SbCl_3$, at 0° to 25° C, thereby causing $SbCl_3$ to crystallize out.

U.S.P. 2,604,431–5 (16.9.47; 22.7.52). (*a*) W. E. Skelton, I. F. German, H. A. Kirsch, and W. V. Overbaugh; (*b*)–(*e*) E. W. Clarke, assrs to Atlantic Refining Co. Fractionation of waxy mixtures *A* by counter-current extraction with a solvent *S* and an additive *B* which is added adjacent to inlet for *A* and also between inlet for *B* and the outlet for the lower melting wax fraction.

In (*a*), *S* = nitrobenzene, *B* = ethylene glycol monomethyl-ether.
In (*b*), *B* = $\beta\beta'$-dichlordiethyl ether, *S* = nitrobenzene + minor amount of *B*.
In (*c*), *B* = furfural, *S* = nitrobenzene + minor amount of *B*.
In (*d*), *S* = acetone, *B* = ethylene glycol monomethyl ether.
In (*e*), *S* = acetone, *B* = aniline.

U.S.P. 2,602,770 (23.5.50; 8.7.52). C. E. Johnson and A. P. Lien, assrs to Standard Oil Co., Chicago. Desulphurizing hydrocarbons by extracting with a mixture of BF_3 and an alkane sulphonic acid.

U.S.P. 2,602,044 (7.4.48; 1.7.52). G. L. Lupfer, R. G. Atkinson, and J. D. Stubbs, assrs to Standard Oil Co., Ohio. Decolourizing clay is added to a furfural extract of a lub oil stock, the slurry heated to decolorize the stock and distil off furfural, MEK added to the residue and the mixture chilled, clay and wax separated, and MEK then removed. V. P. P.

U.S.P. 2,606,140 (30.12.48; 5.8.52). G. B. Arnold, H. V. Hess, and W. E. Skelton, assrs to The Texas Co. Separation of wax constituents and the like from oils by means of urea or thiourea and a solvent.

U.S.P. 2,606,859 (28.2.49; 12.8.52). E. C. Benedict, assr to Phillips Petroleum Co. Propane fractionation of reduced crude oil with recycle of heavier bottoms.

U.S.P. 2,608,517 (4.3.50; 26.8.52). J. L. Tiedje, assr to Standard Oil Development Co. Waxy constituents are removed from oils by diluting the waxy oil, adding a pitch from a waxy crude, chilling to solidify the wax, separating the soldified wax, vac dist the wax, and using the residue as the pitch additive for further batches. J. M. S.

Ger.P. 837,489, 2.10.52. K. Bayerlein and F. Strauss, assrs to F. J. Collin A.G. Process and installation for extracting sulphur from masses containing it, *e.g.*, gas purifiers, with solvents.

Ger.P. 856,680, 25.9.52. H. Kroepelin and H. Steinbrecher. Process for recovering oil-free paraffin from mineral oil and tar processing residues.

BrennstChemie, 1952, **33** (19–20). R. T.

Cracking

983. Reforming aided by passing charge through fuller's earth. W. J. Ziegenhain. *Petrol. Engr*, 1952, **24** (13), C42.—Cat poisoning in the platforming unit at Bell Oil and Gas Co. refinery at Grandfield, Oklahoma, is prevented by passing the naphtha charge stream through fuller's earth before going to the reactor. E. K. J.

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984. Design of fixed-bed catalytic reactors, Pt 11. H. B. Irvin, R. W. Olson, and J. M. Smith. *Chem. Engng Progr.*, 1951, **47** (6), 287–94.—In a previous paper (*cf* Abs. 498 of 1950), an introductory study was made of the Grossman method for predicting the conversion and temp as a function of cat bed depth in a nonadiabetic reactor operated at a mass velocity of 350 lb/(hr) (sq ft). Predicted and experimental results for temp and conversion did not agree well, suggesting need for additional data on effective thermal conductivities in packed beds, also for modification of method itself. Since original paper, temp and conversion data at three additional mass velocities and more accurate effective thermal conductivity data have become available. With this new material, the method has been re-examined and a modified design procedure proposed which gives temp and conversion predictions in reasonably good agreement with observed results. J. G. H.

985. Patents. U.S.P. 2,604,495 (21.7.48; 22.7.52). E. O. Erkko, assr to Hercules Powder Co. Dehydrogenating ethane to ethylene by contacting a mixture of ethane and CO_2 with an iron oxide cat at 750° to 950° C for <3 sec.

U.S.P. 2,605,214 (22.5.48; 29.7.52). L. S. Galstaun, assr to Tide Water Associated Oil Co. In cracking hydrocarbon oils containing nitrogen compounds which poison the cat, the nitrogen compounds are first removed by contacting the oil in liq phase under non-cracking conditions with a cat of low cracking activity.

U.S.P. 2,604,494 (29.12.45; 22.7.52). L. C. Morris and F. M. Smith, assrs to Phillips Petroleum Co. A mixture, bp 250° to 500° F, produced by cat cracking gas oil and containing ≤50 vol % aromatics + naphthenes, 10 to 30 vol % olefins and rest paraffins, is freed from olefins by adding 5 to 15 mol of a lower boiling aromatic hydrocarbon per mol of olefin and then subjecting the mixture to alkylation conditions.

U.S.P. 2,603,591 (11.2.50; 15.7.52). L. P. Evans, assr to Socony-Vacuum Oil Co. Pulsating conversion process in which alternately, hydrocarbon reactants *A* are forced into one side *X* of a bed of powdered contact material, thereby forcing combustion gases *B* out of the bed, and just before emergence of *A* from the other side *Y* of the bed, *B* is forced into *Y* to drive *A* back out of the bed, the conversion products *C* being withdrawn to a collecting zone, flow of *B* being stopped just prior to emergence from *X*, the pulsation of gases in the bed being sufficiently short to provide a continuous flow of *C* of uniform composition.

U.S.P. 2,602,772 (27.5.49; 8.7.52). V. Haensel, assr to Universal Oil Products Co. Reforming gasoline in presence of a cat comprising Al_2O_3, 0·01 to 1 wt % Pt, 0·1 to 8 wt % combined halogen and 0·01 to 1 wt % of an alk earth metal or magnesium oxide.

U.S.P. 2,604,384 (31.10.49; 22.7.52). L. E. Border and R. P. Trainer, assrs to Shell Development Co. Apparatus for regenerating a fluidized cat *A* in which contaminated *A* is passed downwardly through a stripping section of the regenerator in countercurrent to a stripping gas and a part of the regenerated *A* is ejected from the regeneration zone into the stripping zone through inclined conduits.

U.S.P. 2,603,610 (11.6.49; 15.7.52). J. L. Amos, L. H. Silvernail, and F. J. Soderquist, assrs to Dow Chemical Co. Production of bauxite granules by mixing bauxite fines with a solution of colloidal silica of average particle size 100 to 600 Å and pH 9·5 to 10·5 in amount to give from 2 to 20% silica in the fines, shaping the mixture under 100 to 3000 psi pressure, drying and calcining at 600° to 1200° F.

U.S.P. 2,604,379 (23.1.47; 22.7.52). F. R. Archibald, assr to Ancor Corpn. Silica is removed from impure sodium aluminate soln by agitating the soln at 185° F to nearly bp in presence of 4% of a zeolite-type sodium aluminium silicate obtained by adding alkali metal sulphate (50 to 200 gpl) to the aluminate soln. V. P. P.

U.S.P. 2,606,097 (25.8.47; 5.8.52). L. B. Goodson and J. A. Guyer, assrs to Phillips Petroleum Co. Fluidized cat reaction chamber and method of operating the same.

U.S.P. 2,606,144 (10.12.49; 5.8.52). F. W. Leffer, assr to Universal Oil Products Co. Fluidized conversion and coking of heavy petroleums.

U.S.P. 2,606,860 (24.5.49; 12.8.52). J. E. Penick, assr to Socony-Vacuum Oil Co. Conversion of liq hydrocarbons to lower boiling liq using a cat consisting of hydrogen fluoride, 4 to 10% of an oil soluble in hydrogen fluoride and not more than 10% of

water. A temp of 200° to 470° F and a pressure at least 150 psi greater than the vapour pressure of the reaction mixture is used.

U.S.P. 2,606,861 (10.3.49; 12.8.52). S. C. Eastwood, assr to Socony-Vacuum Oil Co. Conversion of liq hydrocarbons to lower boiling liq, cooling and heating being effected by granular solids.

U.S.P. 2,606,862 (20.1.50; 12.8.52). P. C. Keith, assr to Hydrocarbon Research Inc. Cat conversion of hydrocarbons in the presence of cat regeneration gases.

U.S.P. 2,606,863 (14.5.45; 12.8.52). C. A. Rehbein, assr to Shell Development Co. Fluidized cat cracking. Arrangement for stripping fouled cat.

U.S.P. 2,606,877 (27.12.49; 12.8.52). J. P. West, assr to Universal Oil Products Co. Hydrocarbon conversion cat are made by a metathesis reaction between a halide of a Group IV element and a magnesium or aluminium salt of a fatty acid, phenol, or alcohol.

U.S.P. 2,606,878 (28.6.49; 12.8.52). V. Haensel, assr to Universal Oil Products Co. Cat manufacture by mixing a soln of a platinum compound with alumina, heating to 700° to 1100° F, mixing with a halogen-containing solution and again heating to 700° to 1100° F.

U.S.P. 2,607,662 (30.1.46; 19.8.52). L. C. Huff, assr to Universal Oil Products Co. Stripper for subdivided cat particles.

U.S.P. 2,608,470 (1.10.48; 26.8.52). C. J. Helmers and E. V. Mathy, assrs to Phillips Petroleum Co. Process for converting hydrocarbon oils to diesel fuel and carbon black involving cat cracking of the gas oil fraction, thermal cracking of the products, furfural extraction of the thermally cracked product, distilling the raffinate and blending the dist with the naphtha fraction to yield the diesel fuel. The residue from the dist is recycled to the cat cracking stage. The extract phase from the extraction stage is processed to produce carbon black.

U.S.P. 2,608,473 (28.8.48; 26.8.52). J. H. Stephens, assr to Universal Oil Products Co. Apparatus for contacting fluids with solid particles.

U.S.P. 2,608,474 (14.1.49; 26.8.52). A. G. Gilliam, assr to Shell Development Co. Apparatus for contacting vapours with finely divided solid cat.

U.S.P. 2,608,475 (28.5.47; 26.8.52). E. W. Shand, assr to Sinclair Refining Co. Apparatus for converting hydrocarbons in the presence of spheroidal cat pellets.

U.S.P. 2,608,478 (1.2.46; 26.8.52). L. W. Pollock, assr to Phillips Petroleum Co. Continuous process for cracking propane to produce fuel gas, heat of the process being supplied by a stream of hot pebbles.

U.S.P. 2,608,524 (7.5.48; 26.8.52). P. H. Johnson and G. J. Forseth, assrs to Phillips Petroleum Co. A mixture of naphthenic naphtha boiling in the range 250° to 400° F and gas oil boiling in the range 450° to 750° F is contacted with a bauxite cat at 900° to 1050° F under a pressure up to 300 psi and a gasoline fraction is recovered from the product.

U.S.P. 2,608,525 (17.11.41; 26.8.52). C. L. Thomas, assr to Universal Oil Products Co. Cracking hydrocarbons in the presence of a cat prepared by calcination of a composite of silica, alumina, and zirconia obtained by subjecting a zeolite to a mild acid treatment and freeing it from alkali metals.

U.S.P. 2,608,534 (18.4.49; 26.8.52). R. N. Fleck, assr to Union Oil Co. A cat consisting of an inorganic metal oxide or hydroxide as carrier impregnated with 3 to 20% of a nickel salt of a heteropoly acid.

U.S.P. 2,608,594 (8.11.48; 26.8.52). S. P. Robinson, assr to Phillips Petroleum Co. Aromatic hydrocarbons and diolefins are made from natural gas by heating it to 1800° to 2200° F within 0·1 to 0·5 sec, mixing it with a combustion gas at 3600° to 4200° F to raise its temp to 2600° to 3200° F, at which temp it is maintained for 0·001 to 0·02 sec thus producing acetylene and hydrogen, quenching to 1900° to 2200° F and maintaining at this temp for 0·2 to 3·0 sec and recovering the aromatic hydrocarbons and diolefins from the product. J. M. S.

Ger.P. 855,243, 11.9.52. K. Kosterhon, assr to Bad. Anilin- & Soda-Fabr. Method for producing highly-porous masses containing SiO_2 and Al_2O_3 or MgO, or both.

Ger.P. 855,246, 11.9.52. K. Sauerwein, assr to Chem. Werke Hüls G.m.b.H. Installation for carrying out cat reactions.

Ger.P. 854,946, 4.9.52. F. Stöwener, assr to Bad. Anilin- & Soda-Fabr. Method for producing reactive $Al(OH)_3$.

Ger.P. 856,143, 18.9.52. Standard Oil Development Co. Process for reforming hydrocarbons.

Ger.P. 854,512, 4.9.52. H. Sachsse, T. Kosbahn, and W. Chorbacher, assrs to Bad. Anilin-& Soda-Fabr. Process for hydrocarbon conversion in presence of a fixed solid cat.

Ger.P. 855,705, 18.9.52. R. Conrad, H. Kienitz, and K. Hieka, assrs to Bad. Anilin- & Soda-Fabr. Process for dehydrogenation and aromatization of hydrocarbons.

Ger.P. 855,559, 11.9.52. W. Schlenk, assr to Bad. Anilin- & Soda-Fabr. Process for decomposition of mixtures of aliphatic straight-chain compounds with 6 or more C atoms.

Ger.P. 856,678, 25.9.52. H. Klein, assr to Bad. Anilin- & Soda-Fabr. Process for cracking higher- to lower-boiling hydrocarbons.

BrennstChemie, 1952, **33** (19–20). R. T.

Hydrogenation

986. Patents. U.S.P. 2,602,806 (27.4.50; 8.7.52). W. A. Jacob and A. D. Van de Erve, assrs to Armour and Co. Hydrogenation process in which cracked ammonia is introduced into the reaction.

U.S.P. 2,602,807 (26.12.45; 8.7.52). C. E. Morris and F. P. Khym, assrs to Armour and Co. Nickel cat is recovered from hydrogenated oil by adding clay and sulphuric or phosphoric acid and then filtering.

U.S.P. 2,602,070 (15.9.50; 1.7.52). W. J. Kirkpatrick, assr to International Nickel Co. Nickel hydroxide is pptd on a refractory carrier at pH >12·5 by adding a water sol hydroxide to aq nickel salt, and the product extracted with an anhydrous organic solvent (C_{1-5} alcohols or their ethers, furanes, hydrofuranes, pyrans, hydropyrans, and $C_{>6}$ ketones).

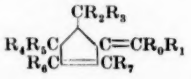
U.S.P. 2,604,455 (U.K. 13.8.48; 22.7.52). P. W. Reynolds and R. L. Robinson, assrs to I.C.I. Ltd. Preparation of foraminate cat by treating an alloy of aluminium and 40 to 80 wt % copper, 30 to 62 wt % nickel, 15 to 55% cobalt, or 30 to 55 wt % iron, with a stream of aq alkali at an uninterrupted space velocity >10 to remove at least part of the surface aluminium, and then without interruption of flow, substituting a stream of aq washing liq of velocity which precludes deposition of alumina on the cat. V. P. P.

U.S.P. 2,606,142 (13.4.49; 5.8.52). H. H. Storch and M. G. Pelipetz, assrs to the U.S.A. (Secretary of the Interior). Liq products are produced by reacting coal at 275° to 700° C with hydrogen under pressure in presence of a cat comprising a finely divided alloy of zinc and antimony.

U.S.P. 2,606,211 (3.8.45; 5.8.52). E. W. Royer and R. L. Iverson, assrs to Koppers Co. Crude butadiene residue is fractionally distilled to yield a fraction containing *n*-butanol and crotonyl alcohol which is passed with hydrogen over a hydrogenation cat. The product is fractionally distilled to isolate *n*-butanol, the remaining fractions being returned to the process. J. M. S.

Polymerization

987. Patents. U.S.P. 2,603,629 (1.10.49; 19.7.52). H. S. Bloch, assr to Universal Oil Products Co. Polymerization process using as a control agent a peroxide of a hydrocarbon of general formula :—



wherein R_0 to R_7 represent H, alkyl, alkenyl, or alkapolyenyl hydrocarbon radicals, <2 groups R_3 to R_7 being hydrocarbon radicals, >2 groups R_0 to R_2 and R_7 being H, said hydrocarbon having mol wt 250 to 1000 and containing 2·5 to 4 double bonds per mol, of which 1·5 to 2·5 are conjugated.

U.S.P. 2,604,468 (6.11.50; 22.7.52). J. E. Underwood and A. Hill, assrs to Diamond Alkali Co. Chlorite–sulphite redox-initiated aq polymerization of vinyl chloride.

U.S.P. 2,603,665 (18.11.48; 15.7.52). D. W. Young, assr to Standard Oil Development Co. C_{10-20} polymers of predominantly straight chain α-olefinic character are produced by contacting gaseous ethylene with a saturated $AlCl_3$–EtCl soln cat at 0° to 20° C and atm pressure, washing the reaction mixture with water, stratifying the liquid, and dist EtCl from the organic layer to leave the polymer.

U.S.P. 2,602,787 (29.7.49; 8.7.52). W. W. Crouch, assr to Phillips Petroleum Co. Preparation of resins by emulsion copolymerization of SO_2 and mono-olefins, with recovery of uncontaminated unreacted SO_2.

U.S.P. 2,602,078 (18.11.47; 1.7.52). W. A. Schulze and W. W. Crouch, assrs to Phillips Petroleum Co. Emulsion polymerization of butadiene with a minor proportion of styrene is short stopped by adding an N-substituted dithiocarbamate.

U.S.P. 2,603,626 (19.3.49; 15.7.52). J. J. Kolfenbach and A. B. Small, assrs to Standard Oil Development Co. Low temp polymerization of C_{4-12} polyolefins with *iso*-olefins using a Friedel–Crafts cat and a C_{1-3} alkyl halide solvent which has been treated with a solution of P_2O_5 in tributyl phosphate.

U.S.P. 2,603,628 (France 3.3.47; 15.7.52). M. L. A. Fluchaire and G. Collardeau, assrs to Soc. des Usines Chimiques Rhone-Poulenc. Polymerizing vinyl allyl ether in solution using as cat: iodine, $AlCl_3$, $SnCl_4$, BF_3, or BF_3–ether complex.

U.S.P. 2,604,467 (23.6.49; 22.7.52). W. W. Crouch and L. A. Mitchell, assrs to Phillips Petroleum Co. Synthetic rubber latex emulsified with a sulphate or sulphonate emulsifier *A* is coagulated by adding a water-sol aluminium salt in amount from 80 to 250% of that required to form a water-insol salt of *A*. The coagulated latex is treated with alkali (pH 9 to 12) and the emulsifier free latex removed. The residual soln is then acidified (pH 1·5 to 4) to ppt the Al salt of the emulsifier, which is then separated, dissolved in a $C_{>4}$ alcohol, and treated with alkali to ppt $Al(OH)_3$ and recover the emulsifier.

U.S.P. 2,604,466 (8.7.47; 22.7.52). C. F. Fryling, J. E. Troyan, and J. E. Pritchard, assrs to Phillips Petroleum Co. Production of synthetic rubber of high tensile strength and low hysteresis by copolymerizing butadiene with a minor amount of styrene at −30° to 50° C in presence of a cat comprising phenyl dimethyl hydroperoxymethane, $Na_4P_2O_7$, $FeSO_4$, and a reducing sugar, together with 0·05 to 1·4 parts by wt of a C_{12-16} alkyl mercaptan per 100 parts of monomers, while emulsified in aq dioxane.

U.S.P. 2,604,465 (20.5.50; 22.7.52). H. G. Schneider, D. W. Young, and H. G. Goering, assrs to Standard Oil Development Co. Selective copolymerization of styrene and *iso*butene in a mixture containing also butene-1, butene-2, and butadiene (>4% of materials other than styrene), at $>10°$ C in presence of $AlCl_3$ only slightly in excess of that required to initiate the reaction.

U.S.P. 2,603,663 (10.5.47; 15.7.52). C. F. Feasley and W. A. Stover, assrs to Socony-Vacuum Oil Co. Aliphatic or alicyclic mono-olefins are condensed with $CF_2ClCFCl_2$ in presence of 0·3 to 5·0 wt % oxygen, based on total wt of reactants, at 25° C/<100 psi.

U.S.P. 2,603,625 (5.9.46; 15.7.52). R. C. Feagin and D. Bandel, assrs to Mathieson Chemical Corpn. Copolymers of dichlorstyrene and 5 to 15 wt % of a polyester of maleic, fumaric, citraconic, itaconic, mesaconic, or aconitic acid, containing a vinyl, allyl, or methallyl ester radical and an alkyl, aryl, alkaryl, or a *cyclo*hexyl or tetrahydrofurfuryl ester radical.

U.S.P. 2,602,071 (23.3.49; 1.7.52). E. C. Haines, assr to G. D. Wetherill Varnish Co. Copolymerization of styrene with China-wood oil, oiticica oil, tall oil, or rosin in

which the monomers are added to the copolymer at above its m.p. so as to maintain a constant ratio between the three, the less reactive monomer being added in a proportion greater than that entering into the reaction.

U.S.P. 2,602,076 (1.8.49; 1.7.52). A. S. Teot, assr to Dow Chemical Co. Production of oil-soluble resins by condensing (*a*) 0·7 mol of a $C_{\geq 10}$ monohydric phenol, any substituent being a *m*-alkyl radical, with (*b*) 1 mol of a C_{8-12} 2-aryl-1-alkene, the aryl group having 6–10 C atoms, 1 nucleus, and ≥ 2 alkyl substituents, in presence of HCl, HBr, or H_3PO_4, and condensing the crude product with CH_2O.

U.S.P. 2,603,655 (20.9.49; 15.7.52). D. E. Strain, assr to E. I. du Pont de Nemours & Co. Copolymer of methyl methacrylate and a condensation product obtained by heating 1 : 3-butadiene with xylene in presence of sodium.

U.S.P. 2,604,463 (27.1.51; 22.7.52). J. A. Bilton and G. H. Segall, assrs to Canadian Industries Ltd. Linear thermoplastic copolymer of glycidyl acrylate *A*, acrylic acid *B*, styrene and methyl acrylate, *A* and *B* being sufficient to cause cross linking of the copolymer on heating and $A + B$ being ≥ 20 wt % of total mass.

U.S.P. 2,604,464 (Can. 3.3.49; 22.7.52.) G. H. Segall and J. F. Clemow, assrs to Canadian Industries Ltd. Thermosetting, infusible, solvent insol polymer suitable as protective coatings which is the reaction product of diphenylol propane diglycidyl ether with styrene–acrylic acid copolymers.

U.S.P. 2,602,075 (U.K. 26.11.48; 1.7.52). A. S. Carpenter, F. Reeder, and E. R. Wallsgrove, assrs to Courtaulds Ltd. Production of thermoplastic fibre-forming resins by condensing equimolar proportions of epichlorhydrin and ≤ 1 *m*- or *p*-dihydric phenol in presence of 1·0 to 1·1 mol alkali per mol of the phenol. V. P. P.

U.S.P. 2,606,163 (5.1.49; 5.8.52). E. D. Morris and G. A. Griess, assrs to Dow Chemical Co. Interpolymers of styrene (I) with a rubbery polymer of a conjugated diolefine (II) are made by heating a solution containing 98 to 85 parts by wt of I, 1 to 15 parts by wt of II and 0·5 to 5 parts by wt of a higher fatty acid or an ester thereof, in a closed vessel at 50° to 100° C until *ca* half of I is polymerized and then heating at 100° to 240° C.

U.S.P. 2,606,174 (25.8.47; 5.8.52). I. M. Kolthoff and C. W. Carr, assrs to Phillips Petroleum Co. Emulsion polymerization of conjugated diolefins using ultrasonic vibrations to effect emulsification.

U.S.P. 2,606,176 (17.9.47; 5.8.52). W. R. Dunn, assr to United States Rubber Co. Emulsion polymerization of acrylonitrile and *iso*butylene.

U.S.P. 2,606,177 (U.K. 9.10.46; 5.8.52). J. Downing, assr to Celanese Corpn of America. A vulcanizable polymer is made by removing from polyvinyl chloride 5 to 10% of its combined HCl content by treatment with an alkali metal hydroxide in presence of a partial ether of a glycol.

U.S.P. 2,606,178 (18.6.49; 5.8.52). M. Kosmin, assr to Monsanto Chemical Co. Emulsion polymerization of styrene using alkali sulphate salts of ethylene oxide condensation products as the emulsifier.

U.S.P. 2,606,179 (23.3.50; 5.8.52). T. Boyd, assr to Monsanto Chemical Co. Ethylene is polymerized in liquid phase using a cat consisting of a mixture of a sodium alkenyl and a sodium alkoxide derived from a methyl alkyl carbinol.

U.S.P. 2,606,881 (8.4.49; 12.8.52). M. Zief and E. Yanovsky, assrs to the U.S.A. (Secretary of Agriculture). The rate of polymerization of polyallyl and polymethallyl ethers of polyhydroxy compounds is increased by mixing the ether with an ester of acrylic or methacrylic acid and passing an oxygen-containing gas through the mixture at a temp below the b.p. of the ester.

U.S.P. 2,606,891 (1.6.49; 12.8.52). S. P. Rowland, assr to Rohm & Haas Co. Styrene and maleic anhydride are copolymerized in an organic solvent with an organic peroxide cat in presence of a mercaptan containing 5 to 12 carbon atoms.

U.S.P. 2,606,893 (15.6.50; 12.8.52). W. B. Reynolds, J. E. Wicklatz, and T. J. Kennedy, assrs to Phillips Petroleum Co. Synthetic rubber is made by polymerizing a mixture of 1 : 3-butadiene and styrene dispersed, in the presence of an emulsifying

agent, in an aq medium having a pH between 9 and 12, in the presence of a monohydroperoxide of *tert*-butyl *iso*propylbenzene, diethylenetriamine, and hydrazine.

U.S.P. 2,606,894 (4.11.47; 12.8.52). G. Pitzel, assr to E. I. du Pont de Nemours & Co. Interpolymers of vinylidene chloride and acrylonitrile are prepared in an aq medium using sulphated methyl oleate as emulsifier, ammonium persulphate as cat, and meta sodium bisulphite as activator, the proportions of cat and activator being determined by reference to a graph.

U.S.P. 2,606,940 (15.6.45; 12.8.52). G. C. Bailey and J. A. Reid, assrs to Phillips Petroleum Co. Polymerization of olefins using as cat nickel oxide dispersed on silica gel containing alumina, the cat having been activated by heating in an oxidizing atm at 400° to 700° C for 0·5 to 12 hr.

U.S.P. 2,607,763 (16.10.47; 19.8.52). H. G. Hipkin, H. B. Horwitz, and A. G. Rogers, assrs to Standard Oil Development Co. *iso*Butylene is polymerized at temp below −20° F in the presence of a volatile solvent and a Friedel–Crafts cat and the cold reaction mixture is atomized by means of a stream of steam, into a flowing stream of hot water. The volatile solvent is vaporized and a slurry of the polymer in water obtained.

U.S.P. 2,608,541 (28.12.48; 26.8.52). J. E. Troyan and L. R. Sperberg, assrs to Phillips Petroleum Co. Synthetic rubber is made by polymerizing a conjugated diolefin dispersed in an aq emulsion, adding rosin acids or alkali metal salts thereof and adding an acidic coagulant. J. M. S.

Alkylation

988. HF alkylation revamps contributes to scrap drive. H. K. Wheeler, Jr, and R. H. Judice. *Petrol. Engr*, 1952, **24** (13), C5–10.—The alterations to the El Dorado refinery of the Pan-Am Southern Corpn have resulted in a reduced HF consumption from 1·2 to 1·0 lb acid per brl of net alkylate and an increased operating factor from 85·8 to 93·5%. HF leakage has been reduced by: (1) bubbling butane charge stock through a continuous HF catalyst to eliminate mixers; (2) eliminating spare rotating equipment liable to apparent freezing during idleness; (3) moving control valves from HF process lines to utility lines; and (4) regenerating spent acid. A general description of the plant is given with details of the blowdown and acid storage areas. E. K. J.

989. Patents. U.S.P. 2,603,666 (21.9.50; 15.7.52). R. J. Fritz, assr to Standard Oil Development Co. Production of lub oil by continuously passing a mixture of 4 to 6 moles of *iso*butane and 1 mole propylene in contact with $AlCl_3$ cat at 60° to 90° F for 5 to 15 min contact time and simultaneously recycling part of the liq product to the reactor, vol of recycled product (minus unreacted *iso*butane) to fresh feed being 4 to 6 : 1. V. P. P.

Ger.P. 857,348, 2.10.52. M. Schütze, assr to Bad. Anilin- & Soda-Fabr. Process for transforming gaseous olefins into liq hydrocarbons.
BrennstChemie, 1952, **33** (19–20). R. T.

Isomerization

990. Patents. Ger.P. 856,887, 2.10.52. H. Krekeler and R. Leutner, assrs to Bad. Anilin- & Soda-Fabr. Method for producing higher *iso*hydrocarbons.

Ger.P. 856,682, 25.9.52. H. Hopff and H. Ufer, assrs to Bad. Anilin- & Soda-Fabr. Process for improving hydrocarbons.
BrennstChemie, 1952, **33** (19–20). R. T.

Chemical and Physical Refining

991. Industrial petroleum chromatography. H. Weil. *Petroleum, Lond.*, 1953, **16** (2), 40–3.—Pt 3 of this review deals primarily with the work of the U.S. National Bureau of Standards (*cf* Abs 1435, 1951; 188 and 726, 1952). The principal problem investigated may be summarized as the determination of the major hydrocarbons in a typical crude pet and the subsequent ascertaining of how their relative proportions vary in different crudes. R. E. P.

992. Autofining, a new solution for an old problem. P. W. Sherwood. *Erdöl u. Kohle*, 1953, **6**, 73–4.—Autofining process (AIOC) is removal of S by hydrogenation over Co–Mo cat, conditions being set so that H_2 requirement for S removal and reduction of olefins is balanced by H_2 produced by dehydrogenation of naphthenes. (In case of similar desulphurizing process operated by Union Oil Co. external H_2 supply is needed.) O_2 and N_2 content is also reduced, thus improving suitability of material as cracking stock. Reaction is exothermic and maintained $<400°$ C. Liq product is caustic washed to remove H_2S, cat is regenerated by air burning. For heavy oils and/or high S content pressure (7 to 25 atm) operation is necessary. Residence time is important factor. Both processes are 99% effective in S removal; typical results are given. V. B.

993. Patents. U.S.P. 2,604,436 (U.K. 17.1.50; 22.7.52). S. M. Adey and F. W. B. Porter, assrs to Anglo-Iranian Oil Co. Ltd. Hydrocatalytic desulphurization of a sulphur and naphthene containing pet fraction, boiling at least in boiling range of wax dist, by vapour phase contact in presence of hydrogen with combined cobalt and molybdenum oxides as a solid moving bed at 750° to 800° F/50 to 200 psi and space velocity 1·0 to 5·0 v/v hr to convert naphthenes to aromatics and organic sulphur compounds to H_2S, a hydrogen rich gas separated from the liq hydrocarbon products being recycled at a rate of 2000 to 4000 cu. ft/brl of feed.

U.S.P. 2,604,437 (23.4.49; 22.7.52). J. E. Connor and C. E. Gustafson, assrs to Standard Oil Development Co. Removing mercaptans from hydrocarbon fractions by contacting with a soln obtained by heating aq alkali metal hydroxide with sulphur.

U.S.P. 2,603,590 (9.7.49; 15.7.52). J. A. Anderson, C. M. Floyd, and E. F. Wadley, assrs to Standard Oil Development Co. Over-extraction of lub oil dist containing naphthenic acids (acid val 1 to 3·5 mg KOH/g) to acid val $<0·1$ mg KOH/g with phenol alone is avoided by using a phenol solvent containing $>10\%$ water and 0·2 to 3·0 times KOH theoretically required for neut at 100° to 250° F.

U.S.P. 2,603,587 (4.1.50; 15.7.52). R. K. Simms, assr to Phillips Petroleum Co. In continuous fractionation of reduced crude lub oil stocks of low asphalt content with liq propane, a body *A* of liq propane containing dissolved oil is maintained in contact with a lower oil-rich phase *B*, *A* being at a higher temp than *B*, liq propane is introduced into *A* near the interface, and oil is introduced at a higher level, any asphalt thereby pptd being deposited on a downwardly moving bed of $\frac{3}{4}$ to 1 inch-dia particles to avoid plugging the apparatus.

U.S.P. 2,605,213 (France 9.5.49; 29.7.52). G. W. Edwards, assr to S. A. Française pour la Separation, l'Emulsion, et le Mélange (Procédés S.E.M.). In refining hydrocarbons with conc sulphuric acid, one component is atomized and caused to impinge at high speed into a thin layer of the other component, the ratio of acid to hydrocarbon being exactly sufficient to react with all the unsaturates.

U.S.P. 2,603,589 (31.3.50; 15.7.52). A. A. Schaerer, assr to Shell Development Co. Mixtures of straight-chain *A* and non-straight chain *B* paraffin waxes are separated by first fractionally dist into fractions of narrow mol wt range, and then fractionally crystallizing the waxes from each fraction at temp at which *A* is completely separated from *B*.

U.S.P. 2,604,430 (24.2.49; 22.7.52). W. E. Skelton, I. F. German, H. A. Kirsch, and W. V. Overbaugh, assrs to The Texas Co. Continuous process for separating wax from a waxy oil which comprises contacting the oil with urea or thiourea in presence of a low mol wt aliphatic alcohol and stratifying the mixture at 70° to 125° F into an oil-rich layer *A* and a solvent-rich layer *B* containing crystalline complex. *A* and *B* are separated. *A* is mixed with an alcohol–water azeotrope *C* and the mixture allowed to settle at 100° F, forming an alcohol-rich layer *D* and a second oil-rich layer *E*, which are separated. Alcohol is dist from *E* to leave wax-free oil. The solid complex from *B* is heated with *C* to liberate wax, which is discharged, the residual hot solution of urea or thiourea being steam dist together with dist from *D* and filtrate from *B* to produce *C* as dist.

U.S.P. 2,605,165 (13.3.48; 29.7.52). R. M. Love, assr to Standard Oil Development Co. Regenerating spent alkali metal plumbite solution by adding an aromatic hydrocarbon to dissolve polymers and gums while contacting with oxygen.

U.S.P. 2,604,438 (23.5.49; 22.7.52). R. A. Bannerot, assr to Shell Development Co. In cat dehydrogenation of sulphur containing hydrocarbon oils, the life of the cat (CoO–MoO) is increased by adding 0·1 to 0·6% S to the feed during the first 2 to 50 hr only of each process period and mixing the feed with <10 atm partial pressure of recycled product gas containing $<1\%$ H_2S. V. P. P.

U.S.P. 2,606,099 (11.6.43; 5.8.52). J. Happel and S. P. Cauley, assrs to Socony-Vacuum Oil Co. Aq alk soln used to remove sulphur compounds from hydrocarbon oils are regenerated by oxidizing to such an extent as to leave sufficient unoxidized sulphur compounds to reduce the quinones, produced in the oxidation of the trihydric phenols present as oxidation promoter in the soln, and removing the oxidized sulphur compounds from the soln.

U.S.P. 2,606,141 (U.K. 19.4.48; 5.8.52). P. Meyer, assr to Anglo-Iranian Oil Co. Ltd. Continuous process for the hydrocatalytic desulphurization of pet hydrocarbons.

U.S.P. 2,606,143 (31.8.50; 5.8.52). J. R. Smith and G. U. Dinneen, assrs to U.S.A. (Secretary of the Interior). Organic nitrogen compounds are removed from shale oils by contacting the oils with magnesium silicate which absorbs the nitrogen compounds.

U.S.P. 2,606,214 (30.9.49; 5.8.52). W. S. Higley, W. J. Zimmerschied, and A. F. Lien, assrs to Standard Oil Co. Straight chain hydrocarbons are isolated from gas oil fractions by first removing polycyclic sulphur compounds by treatment with adsorbent solids or strong inorganic acids and then treating with an aq urea soln to form an adduct of urea and the straight chain hydrocarbons.

U.S.P. 2,607,657 (27.12.48; 19.8.52). I. C. Bechtold and A. L. Kohl, assrs to The Fluor Corpn. Acidic constituents are removed from gaseous mixtures by contacting with a liq basic absorbent for the acidic gas in two stages.

U.S.P. 2,608,519 (29.11.49; 26.8.52). J. F. Peters, A. P. Lien, and H. Shalit, assrs to Standard Oil Co. An olefinic naphtha is desulphurized by extracting with a dialkyl formamide to form an extract containing most of the sulphur compounds and a raffinate containing most of the olefins, separating the solvent from both phases, hydrodesulphurizing the extract phase and blending the product with the raffinate.

U.S.P. 2,608,520 (25.8.51; 26.8.52) E. Arundale and J. P. Thorn, assrs to Standard Oil Development Co. Mercaptans are removed from pet oils by contacting them with ketene.

U.S.P. 2,608,521 (Neth. 6.1.48; 26.8.52). H. Hoog, assr to Shell Development Co. Hydrocarbon oils are desulphurized in the liq phase by hydrogenation in the presence of a cat and a recycled gas rich in hydrogen.

U.S.P. 2,608,522 (5.5.49; 26.8.52). E. J. Niehaus and H. F. Whitney, assrs to Standard Oil Development Co. High quality heating oils are made by contacting a crude heating oil with a sodium hydroxide soln having a gravity of 3° to 7° Bé, subsequently contacting the oil with oxygen and a sodium hydroxide soln having a gravity of 50° to 55° Bé and finally washing with water.

U.S.P. 2,608,523 (30.7.51; 26.8.52). M. T. Waddell, H. W. Earhart, R. M. Love, and J. S. Tiller, assrs to Standard Oil Development Co. In the hypochlorite sweetening of sour pet dist in which the alk hypochlorite soln is recycled, fresh alk hypochlorite is mixed with the recycled hypochlorite and contacted with the dist within 30 sec after mixing. J. M. S.

Ger.P. 855,697, 18.9.52. P. Achenbach, assr to Metallges. A.G. Process for electrical separation of non- or weak-conducting suspended particles from gases or gas mixtures.

Ger.P. 855,841, 18.9.52. P. Achenbach, assr to Metallges. A.G. Electrofilter for purifying gases containing dust and tar.

Ger.P. 857,491, 2.10.52. R. M. Cole, C. L. Dunn, and G. J. Pierotti, assrs to N.V. Bataafsche Petroleum Mij. Process for refining and concentrating unsaturated aldehydes and ketones.

Ger.P. 855,113, 11.9.52. F. Becke, assr to Bad. Anilin- & Soda-Fabr. Process for purification of *cyclo*aliphatic ketones.

Ger.P. 855,749, 18.9.52. P. van Ackeren, assr to H. Coppers G.m.b.H. Tar separator for tarry gases.

Ger.P. 856,344, 25.9.52. H. Haüber and W. Hagen, assrs to Bad. Anilin- & Soda-Fabr. Process for separating carbon monoxide from gases containing olefins.
Brennstl'hemie, 1952, **33** (19–20). R. T.

Special Processes

994. Process developments in U.S.A.—2. Anon. *Petroleum, Lond.*, 1953, **16** (2), 44–7.—Second part of a review made by a technical assistance Mission which toured American manufacturers and plants (*cf* Abs. 245, 1953). Pt 2 describes separation processes, including centrifugal dist plant, lab dist columns, and extractive dist and heat transfer methods, including a description of the newly developed pebble heater. Conclusions made by the Mission are given. R. E. P.

995. How to make phenol. J. M. Weiss. *Oil Gas J.*, 23.2.53, **51** (42), 146.—Four processes for production of phenol described include the chlorine, sulphonation, Raschig, and cumene methods. Flow sheets for sulphonation process are given, and a table shows potential phenol capacity in U.S.A. G. A. C.

996. Oil from coal in South Africa. Anon. *Engineer, Lond.*, 1953, **195**, 123.—Plant being erected at Coalbrook, 55 ml south of Johannesburg, for conversion of coal into pet and diesel fuel. Two processes will be operated, direct hydrogenation of finely ground high grade coal, and Fischer–Tropsch process for low grade coal, of which S. Africa has almost unlimited reserves. Intake rate to Fischer–Tropsch will be 3200 tons per day, and both Kellogg circulation cat units and Ruhrchemie–Lurgi fixed bed cat processes will be used. By 1955 it is hoped that one-eighth country's requirement of pet and diesel oil will be produced. By-products will be 25 tons ammonia liquor per day, 3,000,000 gal low temp tar per year, 14,000 tons paraffin wax per year, oxygenated solvents, and fuel gas for metalworking industries. A. C.

997. Carbon dioxide from fuel oil. Anon. *Industr. Chem. Mfr*, 1953, **29**, 115–18.—Illustrated description of Kestnamine process, suitable for CO_2 output of 100/200 lb/hr and operating on heavy fuel oil (200 sec Red.I/50° F, preferably low S). Oil is burnt with little or no excess air to give flue gas with CO_2 content approaching theory (15%) but ensuring complete combustion. Cooled (45° C) gas freed from SO_2 (10% Na_2CO_3) has CO_2 absorbed therefrom by aq amine, whence it is stripped by steam generated by the combustion of the oil. CO_2 is freed from this steam in condenser, purified by alk $KMnO_4$, compressed to 1800 psi, dried, and bottled. Flow sheet is given. V. B.

998. Obtaining of fatty acid-containing products by oxidation of petroleum slack waxes. H. Pardun. *Erdöl u. Kohle*, 1953, **6**, 10–16.—Work was directed to obtaining products containing 30 to 50% total fatty acids, for use as grease components, etc., without separating out the fatty acids. Applications of such materials are reviewed (22 refs). Raw material was slack wax obtained by dewaxing lub fractions from Hannover crude. Five grades of wax (analyses tabulated) were used with oil contents (at 0° C) of 20 to 42%. Tests were carried out on pilot plant (10 kg) scale, sketch of apparatus given. Slack waxes were found to contain an oxidn inhibitor which could, however, be removed by treating wax with *ca* 30% of oxidn product (neut. val. 70) and settling (12 hr at 80° C), after decanting from resinous ppt, wax thus treated was susceptible to oxidn. Powdered $KMnO_4$ (0·4%) was good oxidn cat, $Ca(OH)_2$ (0·8%) was also effective, but most suitable was 0·1% $Mn(OH)_2$ freshly pptd by NaOH (pptn by KOH yielded inferior product). Typical oxidn conditions were 140° C with 100 ml/kg/hr air. Max acid content of material obtained by direct oxidn was 45% (35% fatty acids + 10% OH acids), product is pale and with neut. val. 70, sap. val. *ca* 150. By saponifying, separating unsap layer and re-acidifying, product having acid content of about 60% is obtainable. Hydroxy acids appear to be mainly formed from oil component of slack waxes, unfavourable influence of such oil is more marked with the higher mol wt paraffins, hence process is more suitable for the spindle and neutral oil slack waxes. V. B.

999. Patents. U.S.P. 2,602,051–69 (publ. 1.7.52). M. De Groote, assr to Petrolite Corpn. Water-in-oil type pet emulsions are broken by adding :—

2,602,051, sucrose–C_{1-4} alkylene oxide reaction product.

2,602,052, cat hydrogenated reaction product *A* of a 2 : 4 : 6-tri-C_{4-18} alkylphenol-$C_{>8}$ aldehyde condensation product, *A* being further reacted with allyl glycidyl ether, the product polymerized and then reacted with a C_{2-4} alkylene oxide.

2,602,053, a synergistic mixture of ethylene oxide -2 : 4 : 6-tri-C_{4-18} alkylphenol-$C_{>8}$ aldehyde condensation product containing $(C_2H_4O)_n$ groups in which (1) n = 2·0 to 2·4, (2) n = 3·0 to 3·6, (3) n = 4 to 4·8.

2,602,054, a compound of formula $HO(C_2H_6O)_nCO{\cdot}\underset{SO_3Na}{CH}{\cdot}CO{\cdot}(OC_2H_6)_nOH$ in which –CORCO– is derived from maleic, fumaric, or citraconic acid, and n = 12 to 80.

2,602,055, the compound of 2,602,054 esterified with a $C_{>8}$ monocarboxylic acid.

2,602,056, the compound of 2,602,054, wherein the hydroxyl groups have been converted to $C_{<8}$ ether groups.

2,602,057, the sodium salt of a sulphonated tri-ester of aconitic acid and a poly (10 to 80) propylene glycol, only one hydroxyl group of each polyglycol molecule being esterified.

2,602,058, the compound of 2,602,057 in which the free hydroxyl groups have been esterified with a $C_{<8}$ monocarboxylic acid.

2,602,059, the compound of 2,602,057 in which the free hydroxyl groups have been converted to $C_{<8}$ ether groups.

2,602,060, a compound of formula $(HOOC)_{n''}RCO(OC_2H_6)_nOR'O(C_2H_6O)_{n'}COR(COOH)_{n''}$ wherein R′ = 2 : 4′- and/or 4 : 4′ – dihydroxydiphenyl sulphone ; $n + n'$ = 15 to 30 ; n'' = 1 or 2 ; R is the radical of the acid $R(COOH)(COOH)_{n''}$.

2,602,061, a compound of the formula set out in 2,602,060, wherein R′ is the radical of a glycerol ether of diethylene glycol monoethyl ether.

2,602,062, a compound of the formula set out in 2,602,060, wherein R′ is the radical of a glycerol ether of a hexyl alcohol.

2,602,063, an acidic partial ester of the dihydroxylated oxypropylation product of a styrene glycol or its hexamer, mol wt 750 to 3500, and 2 moles of a $C_{>32}$ polycarboxylic acid.

2,602,064, a partial ester of formula $R(O(C_3H_6O)_nOCR'(COOH)_{n'})_3$, wherein R is the radical of a water-sol triol containing only C, H, and O ; R′ is the radical of the acid $R'(COOH)(COOH)_{n'}$, R′ containing only C–C, C–H, or ether linkages and n' = 1 or 2 ; n = 6 to 30 ; said triol not containing any radical having ≤ 8 uninterrupted C atoms and the oxypropylated triol having a mol wt 1000 to 5000.

2,602,065, a compound of formula

$$(HOOC)_{n''}RCO(OC_3H_6)_nOCH_2{\cdot}CHEt{\cdot}CHPr{\cdot}O(C_3H_6O)_{n'}COR(COOH)_{n''}$$

where $n + n'$ = 15 to 80 and n or n' can be 0 ; n'' = 1 or 2 ; R is the radical of an acid $R(COOH)(COOH)_{n''}$.

2,602,066, a compound of formula

$$(HOOC)_{n''}RCO(OC_2H_6)_nO{\cdot}\underset{\displaystyle CH_2(OR'')_{n'''}OR'}{\overset{|}{C}}H{\cdot}CH_2{\cdot}O(C_3H_6O)_{n'}COR(COOH)_{n''}$$

wherein n and n' are numerals including 0, $n''' = <10$, $n + n' + n''' = 15$ to 18 ; n'' = 1 or 2 ; R″ = C_{2-3} alkylene radical ; R′ = $C_{<8}$ hydrocarbon radical ; R is the radical of an acid $R(COOH)(COOH)_{n''}$.

2,602,067, a compound of formula

$$(HOOC)_{n'}RCOO\cdot CH_2\cdot CH(O(C_3H_6O)_nR')\cdot CH_2\cdot OOCR(COOH)_{n'}$$

wherein n = 15 to 80; n' = 1 or 2; R′ = $C_{<8}$ hydrocarbon radical; R is the radical of the acid $R(COOH)(COOH)_{n'}$.

2,602,068, a compound of formula

$$(HOOC)_{n'}RCOO\cdot CH_2\cdot CH(OC_3H_6(OC_3H_6)_nOC_3H_5(OR')_2)\cdot CH_2\cdot OOCR(COOH)_{n'}$$

wherein n = 15 to 80; n' = 1 or 2; R′ = $C_{<8}$ hydrocarbon radical; R is the radical of the acid $R(COOH)(COOH)_{n'}$.

2,602,069, a compound of formula

$$(HOOC)_{n''}RCO(OC_3H_6)_nOR'O(C_3H_6O)_nCOR(COOH)_{n''}$$

wherein R′ is the radical of a glycerol ether of *cyclo*hexanol; $n + n'$ = 15 to 80; n'' = 1 or 2; R is the radical of the acid $R(COOH)(COOH)_{n''}$.

U.S.P. 2,602,077 (22.12.49; 1.7.52). M. De Groote and B. Keiser, assrs to Petrolite Corpn. Glycol ethers of phenol–acetylene resins.

U.S.P. 2,602,079 (12.11.48; 1.7.52). M. De Groote and B. Keiser, assrs to Petrolite Corpn. Production of hydrophile synthetic products by condensing a C_{2-4} alkylene oxide with a polymer of $CH_2{:}CHCOOR$, $CH_2{:}CMeCOOR$ or $CH_2{:}CHOCOR$, wherein R is an aliphatic hydrocarbon radical of 5 to 20 carbon atoms which may contain hydroxyl groups.

U.S.P. 2,602,087 (12.11.48; 1.7.52). M. De Groote, assr to Petrolite Corpn. Production of water-sol esters by reacting a C_{2-4} alkylene oxide with a compound of formula $RRN(R_1O)_nOCR_2$, wherein R is a saturated hydrocarbon radical of 2–10 C atoms; R_1 = C_{2-4} alkylene or C_{3-4} hydroxy alkylene radical; n = 1, 2, or 3; R_2CO is derived from a C_{8-20} detergent forming monocarboxylic acid.

U.S.P. 2,604,490 (Ger. 15.2.50; 22.7.52). W. Reppe. Production of aliphatic dicarboxylic acids by reacting CO and H_2O with an $\alpha\beta$-unsaturated monocarboxylic acid in an alk medium at elevated temp and pressure in presence of a complex nickel cyanide cat.

U.S.P. 2,603,610 (11.6.49; 15.7.52). J. L. Amos, L. H. Silvernail, and F. J. Soderquist, assrs to Dow Chemical Co. Preparing a dehydrogenation cat by mixing K_2CO_3, $K_2Cr_2O_7$, and Fe_2O_3 with 3 to 15 wt % of a powdered methyl cellulose whose 2% aq sol at room temp has vis 2000 to 3000 cp and enough refractory cement to make an extrudable paste, extruding the paste and forming pellets therefrom, drying the pellets, and then heating them in steam at 600° to 650° C to decompose the methyl cellulose.

U.S.P. 2,603,195 (12.7.49; 15.7.52). K. Permann, assr to Shell Development Co. Fluids sensitive to excessive temp are heated by flowing through vertical tubes surrounding a combustion space containing a burner, the tubes being shielded from excess radiant heat by ejecting flue gas upwardly into the space between the burner and the tubes. V. P. P.

Ger.P. 855,845, 18.9.52. W. Reppe, assr to Bad. Anilin- & Soda-Fabr. Method for producing nickel carbonyl.

Ger.P. 857,043, 2.10.52. N. Michael, assr to Bad. Anilin- & Soda-Fabr. Process for reaction of carbon monoxide with hydrogen.

Ger.P. 855,105, 11.9.52. W. Eckert and F. Quint, assrs to Farbwerke Hoechst. Process for halogenating hydrocarbons.

Ger.P. 857,351, 2.10.52. H. Vollmann, assr to Farbenfabriken Bayer. Process for chlorination of naphthalene.

Ger.P. 857,355, 2.10.52. H. Weghofer and G. Göttmann, assrs to Krupp Kohlchemie G.m.b.H. Process for nitration of saturated non-aromatic hydrocarbons.

Ger.P. 857,047, 2.10.52. H. Kröper and H. Schlenk, assrs to Bad. Anilin- & Soda-Fabr. Method for producing fatty acids or their salts.

Ger.P. 855,257, 11.9.52. W. Rottig, assr to Ruhrchemie A.G. Process for dehydrogenation of cyclic hydrocarbons.

Ger.P. 855,854, 18.9.52. K. Maier, assr to Bad. Anilin- & Soda-Fabr. Process for dealkylation of alkylphenols.

Ger.P. 856,679, 25.9.52. H. Jochinke, assr to Bad. Anilin- & Soda-Fabr. Process for obtaining pure aromatic hydrocarbons from mixtures of non-aromatic hydrocarbons. *BrennstChemie*, 1952, **33** (19–20). R. T.

Metering and Control

1000. Improvement of catalysts and catalyst supports. C. H. Riesz, H. A. Dirksen, and W. J. Pleticka. *Petrol. Engr*, 1952, **24** (13), C17–20.—The effect of six types of support and seventeen promoters on the cat conversion of natural gas to hydrogen using 5% nickel cat is tabulated in terms of percentage equilibrium conversion, which is defined as the ratio of actual expansion to equilibrium expansion. The results were obtained on a lab apparatus, carefully prepared and with a natural gas of constant average composition, and studies on a pilot plant confirmed the general conclusions of lab results. E. K. J.

1001. Recent developments in instruments. E. C. Klepp. *J. Inst. Fuel*, 1953, **25** (147), 295.—A historical survey is given of developments in the use of automatic control for industrial processes. Future trends in this field are discussed. Particularly noted is the planning of instruments and panels. One of the most important advances in instrument design is the very wide recognition of the force-balance or null-method principle, and its application to new instrument designs is shown.

Some new measuring instruments described include an oxygen analyser, dew-point hygrometer, magnetic amplifiers, and an infra-red spectrometer. A two page discussion is appended. D. K.

1002. Proportional sampling device for metered liquids. P. Hart and R. C. King. *Oil Gas J.*, 2.3.53, **51** (43), 93.—A description is given of a flow integrator installed in an existing meter, together with a diagram. The system has proved satisfactory over several years, and is within the accuracy of flow-meter measurements. G. A. C.

1003. The temperature of the gas receiver and its regulation by the temperature alarm device. A. Haarmann. *BrennstChemie*, 1952, **33** (19–20), 321–7.—Important tech problems in control of excess heat formed during coal dist are discussed. An elec recording device, described and illustrated, enables the temp in each gas receiver in a battery of coke ovens to be maintained at the optimum synthesis val for hydrocarbon yield under all operating conditions. 12 refs. R. T.

Products

Chemistry and Physics

1004. Some recent advances in naphthenic acid technology. J. L. Jezl. *Petrol. Process.*, 1953, **8** (1), 89–90.—Naphthenic acids are not only present in lower fractions of crude oil, but extend well through the lub oil fractions. The higher mol wt acids, containing 14 to 30 carbon atoms with mol wts of 250 to 450, differ considerably in properties from the well known low mol wt product. The higher naphthenic acids show properties more like hydrocarbons, and in this respect are distinguished from the lower members.

Naphthenic acids undergo most reactions of carboxylic acids, but give derivatives that are widely different from those of fatty acids. Such products have promising use as plasticizers, solvents, surface active agents, etc., and applications are found in the fields of textiles, paper, leather, rubber, and plastics.

The many varied derivatives that can be produced from naphthenic acids are reviewed, together with some of the newer fields of application. J. W. H.

1005. Detergency of carbon black. Pt 4. Influence of the liquid phase on the settling behaviour of dispersions. F. H. Garner, M. F. Mohtadi, and C. W. Nutt. *J. Inst. Petrol.*, 1952, **38**, 974–86.—The rates of settling of a carbon black in a number of pure organic liq and in soln containing additives have been investigated. It has been confirmed that the detergent effect of an additive can be correlated with its degree of adsorption on the carbon particles and that generally metal soaps, particularly calcium and barium, are effective detergents in non-aq media. For a range of pure liq and liq mixtures a correlation has been shown to exist between the detergent efficiency and the product of the density of the liq and its surface tension. A. R. W. B.

1006. Detergency of carbon black. Pt 5. Electrokinetic phenomena in Micronex dispersions in organic liquid media. F. H. Garner, C. W. Nutt, and M. F. Mohtadi. *J. Inst. Petrol.*, 1952, **38**, 986–97.—An electrical double layer has been shown to be present at the surface of the particles of carbon black (Micronex) dispersed in organic liq. The potential of the outer shell of the double layer can be either positive or negative with respect to the carbon particle. This electrical double layer is responsible for the stability of the disperse system. Such systems have been shown to exhibit the phenomena of electrophoresis, electro-osmosis, and sedimentation potential in a manner analogous to aq systems. A. R. W. B.

1007. The occurrence of mixed aromatic-naphthenic hydrocarbons in petroleum as related to structural group analysis of heavier fractions. K. van Nes, H. I. Waterman, H. A. van Westen, and H. van Kranen. *J. Inst. Petrol.*, 1952, **38**, 998–1002.—The aromatic portions of three narrow-boiling gas oil fractions from widely divergent crudes were isolated chromatographically and then analysed by element analysis and mol wt determinations before and after hydrogenation. The results show that the greater part of the aromatic mol of pet contain naphthenic rings. It is therefore considered that methods of analysis of pet products which neglect these mixed-type compounds are of questionable accuracy. A. R. W. B.

1008. Schlieren photographs of advancing flames in extended transverse electric fields. Anon. *BrennstChemie*, 1952, **33** (21–22), 370–5.—A brief review of previous work on flames is presented. The advance of a propane flame in an extended tube, through a transverse elec field, was investigated by means of the apparatus described and illustrated. The flame tip was observed to travel with increased velocity along to the cathode plate. Observations are supported by instantaneous photographs of regions of varying refraction. These photographs show essentially weaker contours and contrasts than the normal flame. They indicate a correspondingly weaker density gradient in the hydrodynamic discontinuity surface, and suggest that the flame is weaker than without an elec field. R. T.

1009. Position of radical attack during oxidation of long chain paraffins. J. L. Benton and M. M. Wirth. *Nature, Lond.*, 1953, **171**, 269.—*n*-Decane was autoxidized with O_2 at 145° C until the hydroperoxide conc reached 2·5% w/w. The product was then reduced, by different routes, to give alcohols, and the mixtures were examined by infrared analysis to determine the amounts of isomeric decanols. It was found, from the relative amounts of isomers, that the terminal methyl group is attacked to a small extent, but the major attack is distributed almost equally on all the CH_2 groups of the *n*-decane chain. H. C. E.

1010. Synthesis and properties of tetrapropylmethane, tetrabutylmethane, and tetrahexylsilane. A. D. Petrov and E. A. Chernuishev. *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk*, 1952, 1082–6.—Condensation of tripropylcarbinol chlorhydrin with propyl bromide in presence of Mg yielded 12·7% $C(C_3H_7)_4$, b.p. (6 mm) 60° to 62°, m.p. −26·5°, d_4^{20} 0·7706, n_D^{20} 1·4322. By a similar reaction, a 17% yield of $C(C_4H_9)_4$ was obtained, product had b.p. (6 mm) 103° to 104°, m.p. −6°, d_4^{20} 0·7935, n_D^{20} 1·4440. Attempts to prepare tetrahexylmethane were unsuccessful, although the Si analog was synthesized. V. B.

1011. Catalytic hydrocondensation of carbon monoxide with olefins. 9. Reaction of methyl and ethyl alcohols with ethylene. Ya.T. Eidus and I. V. Guseva. *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk*, 1952, 1075–81.—(Cf. Abs. 808 of 1953). As

MeOH and EtOH decomp on cat with formation of CO and H_2, these compounds should undergo hydrocondensation reaction with olefins. Experiment confirms that reaction occurring (as shown by yields and product properties) between MeOH (or EtOH) and C_2H_4 is very similar to that occurring between C_2H_4 and CO + H_2, thus confirming the initial hypothesis. V. B.

1012. Adsorption of gas mixtures. 2. Absorption of ethylene and propylene on activated charcoal. B. P. Bering and V. V. Serpinskii. *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk*, 1952, 997–1007.—Adsorption was measured, at 7° and 25° C, over pressure range 0 to 760 mm for C_2H_4, 0 to 300 mm for C_3H_6 and a mixture of the two gases. Results are discussed in detail and a series of isosteres plotted; isosteres of total adsorption are linear. Selectivity coeff for C_3H_6 increases with fall in total pressure and temp. Expressions are derived for the heats of adsorption of the components from the mixture, and the partial differential heats of adsorption are calc. V. B.

1013. Electronic absorption spectra of polystyrene and its derivatives. M. V. Vol'kenshtein and N. S. Kolodina. *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk*, 1952, 1033–6.—U.V. (2000 to 3000 A) spectra of following hydrogenated-monomer/polymer pairs were determined: ethylbenzene/polystyrene; *o*-bromotoluene/poly-*o*-bromostyrene; 2 : 5-dichlorethylbenzene/poly-2 : 5-dichlorstyrene. Soln were 0·02M (based on monomer) in $CHCl_3$. Absorption curves were similar for each of the pairs; spectrum of polystyrene is different from that of styrene, so that presence of unpolymerized styrene in polystyrene can be detected. Spectrum of polystyrene in *cyclo*hexane was similar to that in $CHCl_3$. Spectra of polyphenylethyl and *p*-xylene were also compared and shown to be similar (both having absorption band at 2640 A), indicating that persistent dark brown colour of polymer is probably due to tarry impurity formed during polymerization and is not inherent in the polymer itself. V. B.

1014. Thermodynamic properties of ethyl alcohol. R. C. Ried and J. M. Smith. *Chem. Engng Progr.*, 1951, **47** (8), 415–18.—A tabulation of volume, enthropy, enthalpy, and fugacity from 32° F and 0·238 psia to the critical point, 469·4° F and 928 psia in 10° F temp increments for ethyl alcohol is presented, results being also shown graphically on a pressure–enthalpy diagram; the saturated liq, saturated vapour, and superheated vapour regions are included. J. G. H.

1015. Patent. Ger.P. 857,367, 2.10.52. E. Rager and W. Schmidt, assrs to Bad. Anilin- & Soda-Fabr. Method for producing diolefins.
BrennstChemie, 1952, **33** (19–20). R. T.

Analysis and Testing

1016. Fast spectrographic method for metal impurities in cracking feed. Anon. *Petrol. Process.*, 1953, **8** (1), 101–2.—Conventional methods of chemical analysis for the determination of minute quantities of heavy metals in cat cracking stocks, such as colorimetric, gravimetric, and volumetric, are time-consuming operations, and may involve taking a large sample, which in the course of the experiment may be destroyed.

A modified spectrographic method, having many advantages over the chemical method, is used by The Texas Co., U.S.; this permits qualitative and quantitative estimation of the various metals present by the relative densities of the spectral lines. The oil to be tested is introduced directly into an arc, and the resulting radiation energy is analysed into a line spectrum by a slit and diffraction grating. The excitation technique employed is fully discussed. J. W. H.

1017. Special requirements of corrosion testing of lubricating oils. A. Bukowiecki. *Schweiz. Arch. angew. Wiss.*, 1953, **19**, 22–31.—Owing to complexity of modern oils caused by presence of additives, analytical tests (*e.g.*, neut. val.) are of little value in assessing corrosive or protective properties, and actual tests with metals concerned are required. Nature of attack by doped oils on metals and previous work is discussed. For assessing high temp attack on metals, modified Indiana test has been developed:

oil at 140° C in open beaker, stirred at 1100 r.p.m., plates of metal (Pb, Cu, Fe) immersed and changed every 3 hr, total loss for each metal after 18 hr serving as criterion. Premium and Regular grade oils can thus be clearly differentiated by lower loss caused on Pb by former. The usual test for corrosive S (Cu strip) should be carried out at 120° C and for 24 hr min in order to detect attack. Tests on dispersions (5%) of water in oil indicate rust-protective action of stearic acid (½%), which is slightly reduced by substituting water by 3% NaCl; method was covering iron plate, lying at bottom of glass dish, with dispersion for one week at room temp (60° C for turbine oils.) Tests with motor oils indicated rust preventing action of Premium grade oils and also protection afforded by used oils. Protective action of residual oil film on stationary equipment was assessed either by drops of water or acid (HCl) vapour. Water drop test is more severe than glass dish test with water-in-oil dispersion. After-rusting test (cf Abs. 2440 of 1951) is also described. It is now carried out at 120° C in place of 100° C previously recommended. Test results are illustrated by numerous photographs of test strips. Necessity of prior careful cleaning of test strips is stressed. V. B.

1018. Determination of percent voids filled in roofing. C. E. Wilkinson. *Petrol. Engr*, 1952, **24** (13), C37–40.—A method to check the saturation efficiency of plants manufacturing roofing and saturated felt is described. The amount of soap soln required to fill the voids is measured by difference of level of soap soln before and after evacuation of the system containing the sample submerged in the soap soln. Satisfactory saturation of asphalt felt to ensure protection against pronounced blistering requires at least 87% of voids to be filled with asphalt. Advantages of the method include test duration of less than 10 min, accuracy, no handling hazard, and no temp control. E. K. J.

1019. A special thermocouple for measuring transient temperatures. D. Bendersky. *Mech. Engng*, 1953, **75** (2), 117.—A small thermocouple of rugged construction and rapid response has been developed. The probe is a thick-walled steel tube, 0·090 inch O/D, inside which runs a nickel lead wire insulated from the tube by a film of nickel oxide. The end of the probe is plated with a layer of nickel 1μ thick, the interface between the nickel plating and steel tube comprising the hot junction. The probe is mounted in a steel body, and a lucite insulator is employed between the body and the nickel terminal post. A detailed description of manufacture of the probe, method of deposition of the nickel plating, and details of installation and recording equipment are given. The time constant for this instrument is claimed to be approx ¼μ sec. 3 refs. T. T.

1020. The Liebermann–Storch reaction. R. Paulson. *J. Oil Col. Chem. Ass.*, 1953, **36** (393), 127.—The Liebermann–Storch reaction for the detection of rosin and other resins in surface coating materials is discussed. The history of the reaction and its recent developments are reviewed.

The author has investigated the reaction, and a method used by him giving consistently reliable results is described. The characteristic colours produced by various samples of film forming and allied materials are listed. Note is made of materials which interfere with rosin detection. D. K.

1021. Combustion characteristics of diesel fuels as measured in a constant-volume bomb. R. W. Hurn and K. J. Hughes. *S.A.E. Quart. Trans.*, 1952, **6** (1), 24–35.—A C.R.C. report. Data are presented indicating the circumstances occasioning the preparation of this report. The use of a constant-vol combustion bomb to obtain data on the ignition characteristics of commercial-type and specially prepared diesel fuels is described in some detail. The data so presented show the effect of aromatic and dicyclic compounds in increasing fuel ignition lag, and temp sensitivity, also the effects of oxygen concentration and amyl nitrate as an ignition improver. Combustion records of some aromatic fluids suggest a two stage combustion process and emphasize that fuel ignition is not necessarily a threshold phenomenon.

Ignition characteristics of fuels are shown for wide ranges of pressure and temp. It is indicated that such wide range characterization of any fuel ignition properties should be useful in more accurately predicting its combustion behaviour under widely varied operational conditions. J. G. H.

1022. Oxygen estimation in gases with chromium (II.)—chloride solution. K. Büchner. *BrennstChemie*, 1952, **33** (19–20), 327–9 (*Report from Lab. of Ruhrchemie A.G., Oberhausen*).—Investigations on O_2 determination with $CrCl_2$ soln are presented with supporting tables and curves. A conc soln, preferably containing 15 to 30 wt % $CrCl_2$, is required. The soln must be very pure so that no gases, *e.g.*, H_2 due to presence of Zn, or H_2S due to SO_4-ions, are evolved. The soln absorbs atm O_2 rapidly, so must be protected under ligroin. The soln is suitable for manual use and in automatic apparatus, and is stable for some months. The estimation is rapid, applicable to pure O_2 or traces in commercial gases and in the temp range 10° to 30° C. Superiority over conventional estimation with pyrogallol soln is shown by more rapid max absorption and fewer passages. R. T.

1023. Information on cold-resistant tar oils. W. Fuchs and W. Schmidt. *Brennst-Chemie*, 1952, **33** (19–20), 338–43. (*Chem.-Techn. Inst. Rheinisch-Westfälisch Techn. High School, Aachen.*)—An investigation of cold-resistant tar oils on a lab scale, supported by tables and curves of relevant data, is reported. Fuel oil is separated into filtrate and sediment after cold fractionation. The sediment, consisting chiefly of aromatics, is hydrogenated to obtain as far as possible liq hydroaromatics which are mixed with the original filtrate, after separating any occurring carbazol. Tests show that an oil so prepared is stable for 240 hr at −10° C. 12 refs. R. T.

Gas

1024. Underground storage of natural gas in coal-mining areas. H. P. Wheeler, Jr., and W. E. Eckard. *U.S. Bur. Min. Inf. Circ.*, 7654, Dec. 1952.—The growth of underground storage of natural gas, the reason for such storage in the Appalachian and other regions, and the hazards of storing gas underground in a coal-mining area are described. The choosing of a field for such storage is discussed, and the development of a gas-storage field is considered from the aspects of: legality, finding and reconditioning old wells, new construction, and storage pressures. A comparison of estimated capital costs for various types of natural gas storage is given, and charts showing a typical seasonal cycle of the Equitable Gas Co and types of gas fields in the Appalachian region are shown. Methods of cementing casing in a gas well and of plugging a well for abandonment are described. W. H. C.

1025. Patents. U.S.P. 2,605,170 (6.5.46; 29.7.52). J. P. Fugassi, assr to U.S.A. (Secretary of the Navy). Production of nitrogen by alternately passing air for *ca* 1 min through a spirally coiled tubular chamber having closely adjacent coil sections and containing copper at 500° C and then passing a hydrocarbon volatilizable up to 200° C through the chamber to reduce the copper oxide.

U.S.P. 2,605,175 (7.12.48; 29.7.52). E. R. Barber, assr to The Texas Co. Production of carbon monoxide and hydrogen by partial combustion of a hydrocarbon fuel in an I.C. engine. V. P. P.

Ger.P. 856,030, 18.9.52. W. Guntermann, assr to Bamag-Meguin A.G. Device for preventing gas overflow from the raw to the pure gas side, *e.g.*, in high-pressure plant.

Ger.P. 856,033, 18.9.52. H. Deringer, assr to Gebr. Sulzer A.G. Process for separating and recovery of carbon monoxide from gas mixtures.

Ger.P. 856,195, 18.9.52. W. Guntermann, assr to Bamag Werke für Eisenverarbeitung A.G. Process for cooling coal dist gases.
BrennstChemie, 1952, **33** (19–20). R. T.

Engine Fuels

1026. The effects of fuel additives on the precombustion reactions of *n*-heptane. A. O. Melby. *J. Inst. Petrol.*, 1952, **38**, 965–73.—A motored engine has been used to study precombustion reactions of *n*-heptane containing various additives. The compression ratios required for the occurrence of cool flame radiation and auto-ignition were determined at various intake manifold air pressures. It was found that tetraethyl lead does not influence appreciably the conditions required to obtain cool flames with *n*-heptane, but increases considerably the time required for cool flames

to pass into auto-ignition, whereas methyl aniline retards markedly the pre-cool flame reactions. Di-*tert*-butyl peroxide accelerates the cool flame reactions of *n*-heptane. A. R. W. B.

1027. Annual diesel-fuel survey—1952. O. C. Blade. *Oil Gas J.*, 16.2.53, **51** (41), 154.—The survey is compiled from 285 samples of diesel fuel manufactured in 106 refineries in the U.S., and is given in five tables showing properties. G. A. C.

1028. Running costs with heavy fuel oils. A. G. Arnold. *Mot. Ship*, 1953, **33** (395), 458.—This is an extract from a paper read at a meeting of the Inst. of Marine Engrs, and includes a page of reported discussion. The author's experience, as Superintendent Engineer of Alfred Holt and Co, of the operation of two- and four-stroke cycle diesel engines on boiler oil since the war is reported, and running costs calculated and compared with those for diesel oil. U. M.

1029. Influence of gasoline composition on its behaviour in automobile engines. J. A. Cowderoy and I. G. Withers. *Erdöl u. Kohle*, 1953, **6**, 66–72.—Various features of gasoline spec are discussed in relation to fuel behaviour. Min start temp is given by $t_{start} = 0{\cdot}67t_{10} - 58$, where t_{10}(° C) is ASTM 10% dist pt; for German winter conditions, t_{10} should be $<60°$ C. Suitable criterion of warm-up duration is $\frac{t_{50} + t_{80}}{2}$, once warm-up is attained various fuels show little difference in acc characteristics. Fuel dilution, although dependent on 90% dist temp, varies largely with engine design and operating conditions, thermostat-fitted engines show, after 10,000 km short-run winter operation, dilution of only 1·2%. Neither dist curve nor v.p. indicate tendency to bubble formation and percolation, which can be assessed by vapour/liq ratio of fuel, which should be about 25/1, at fuel feed system temp; engine and body lay-out are important factors in this respect. Evap loss from tank amounts to 1 to 2%. O.N. requirements and factors affecting these are considered. Relationship between road and laboratory O.N. is illustrated, average road O.N. = Res. $- \left(\frac{\text{Res.-Motor}}{6}\right)^2$, range of required O.N. is greater for British than for U.S. cars. For max power output mixture richness must be 15% in excess over stoichiometric, fuel consumption can be decreased by about 1% for every 2% sp gr increase, provided carburettor adjustments are made. Lab gum tests do not satisfactorily indicate possibility of deposit formation, and this can be better assessed by passing gas/fuel mixture through pipe system having 100° C entry and 200° C exit temp, deposit being extracted and weighed. Combustion chamber deposits from leaded fuels are less in irregular operation than in steady running. Tank and fuel line corrosion is almost wholly due to adventitious H_2O; S content has little effect on corrosion or wear, in normal operation. V. B.

1030. Patents. U.S.P. 2,603,557 (10.9.48; 15.7.52). M. S. Roush, assr to Thompson Products Inc. Stable anti-knock supplementary fuel emulsion composed of 10 to 20 vol % water, 80 to 90 vol % C_{1-3} monohydric alcohol, 3 cc/gal T.E.L. and $\frac{1}{2}$ to 1 wt % of a mixture of a corrosion inhibiting emulsifier (alkali metal salts of pet sulphonic acids of green acid type, fatty acid soaps, or a glycerol) and kerosine to reduce sp gr. V. P. P.

Ger.P. 856,142, 18.9.52. E. Donath and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Method for producing high power motor fuel from gasolines.

Ger.P. 856,144, 18.9.52. M. Pier and U. Mohr, assrs to Bad. Anilin- & Soda-Fabr. Method for producing motor fuels.

Ger.P. 856,492, 25.9.52. M. Pier, E. Donath, and F. Christmann, assrs to Bad. Anilin- & Soda-Fabr Method for producing heavy-duty motor fuels from hydrocarbon mixtures.

Ger.P. 856,493, 25.9.52. M. Pier, E. Donath, and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Method for producing motor gasoline knockproof and stable in storage.

Ger.P. 856,977, 2.10.52. H. Gruber. Method for producing a solid motor fuel of high energy content.

BrennstChemie, 1952, **33** (19–20). R. T.

Gas Oil and Fuel Oil

1031. Emulsions of seawater in Admiralty fuel oil, with special reference to their demulsification. W. Killner. *J. Inst. Petrol.*, 1953, **39**, 51–5.—Lab and storage tank tests carried out on fuel oil–seawater emulsions indicate that they can be broken in a matter of minutes by the addition of Teepol, provided that the temp of the emulsion can be raised to about 265° F. A. R. W. B.

1032. Farm drying of grain and seeds. J. Woodforde. *J. Inst. Fuel*, 1953, **25** (147), 327.—A brief review is given of various drying machines and plants to show the diversity of mechanical design and of conservation of process. The machines described include : continuous flow plant, *e.g.*, horizontal and vertical types, ventilated silos and bins, and platform driers. Control of the drying process and some future problems are also discussed. D. K.

Lubricants

1033. The evaluation of engine lubricating oils. N. Kendall. *J. Inst. Petrol.*, 1953, **39**, 26–47.—The factors to be considered in the assessment of engine oils for satisfactory performance in the field by means of lab and engine tests are discussed. Refs are made to typical standard testing procedures. A. R. W. B.

1034. Oil additives and the mechanism of their performance. W. Zajezierski. *Nafta (Krakow)*, 1952, **8**, 99–102, 125–8, 155–9.—Increasingly strenuous conditions of work of mechanical and propelling units places greater demands on their lubrication, and whereas high degree of sulphuric acid and solvent refining produces lubricants of homogeneous, most paraffinic nature, their properties in some respects are still in need of improvement or, in some others, may even have been damaged by the removal of aromatics and olefinic constituents. Seven main groups of qualities of lubricants are subject to improvement by small quantity of additives :—

(1) Lowering of cloud point and pour point is achieved by addition of *ca* 1% wt/vol of aromatic compounds with large side chains (Paraflow and Santopour). Two Soviet products are mentioned : Aznii and Voltole, the latter being a polymer of short units obtained by silent discharge cracking of oils. This is added in *ca* 5% wt/vol, and it also improves the V.I. of the oils.

(2) Other substances improving V.I. are Exanol ($C_{186}H_{371}$), a polymer of *iso*-olefines, Univis, the Soviet products Superol and Superol U of MWs *ca* 23,000 and 7500 obtained by polymerization of *iso*butylene at −78° C or −11° C respectively, which actually nearly double the V.I. Oppanol (another *iso*butylene polymer, MW 80,000 to 400,000) and aldehydic, ketonic, and other polymers of MW > 30,000 are in use.

(3) High pressure adhesive qualities of lubricants depend on presence of polar hydrocarbons which normal refining processes remove whilst improving the V.I. Introduction of higher unsaturated fatty acids is useful, but they are easily oxidized to short chain acids. Instead, aliphatic–aromatic ketones or nitrile polymers are used. The former often depress the pour point. For extra high pressures, sulphuretted and chlorinated soaps of lead or zinc are in use.

(4) Antioxidants are most frequently aminophenolic in character, and their addition is required because the naturally occurring aromatics have been removed by refining. Their action is due to the fact that, since oxidation is a chain reaction, the antioxidants which can exist as radicals terminate such reactions.

(5) To prevent formation of deposits, soaps and various detergents can be used.

(6) To prevent corrosion, two methods are available : (*a*) formation of hard surface compounds, *e.g.*, sulphides, or (*b*) introduction of a compound which will be absorbed on the metal surface. $(RO)_2P$ belong to this group. Soviet preparations are of organometallic compounds known as Ciyatin-336, Aznii-4, and Nami-25, which act as detergents and pour point lowering compounds.

(7) Silicones are used as antifoaming agents.

All above additives and their action are described and data collected in eight tables. Refs given to three Soviet books and one American. M. S.

1035. Synthetic lubricants. W. A. Zisman *et al.* *Oil Gas J.*, 2.3.53, **51** (43), 74.—Engineering possibilities for synthetic lubricants, use in winter operation of automatic engines, and performance of turbo-engine synthetic oils are dealt with, and properties of certain oils (including ester type) listed. G. A. C.

1036. Greases. G. Cibula. *Erdöl u. Kohle*, 1953, **6**, 97–9.—Principles of grease manufacture are outlined, and factors influencing grease structure discussed (*e.g.*, low V.I. naphthenic oils give stabler greases than high V.I. paraffinic). Main grease characteristics are structure, hardness, consistency, and lubricity. Only hardness can be precisely measured (penetration). Table is given inter-relating Karns–Maag penetration units (10 to 45 at 24° C) with ASTM (150 to 315 at 25° C). Choice of greases for various types of bearing is described; Ca greases must be used below mp of soap (*ca* 100° C), since molten Ca soap accelerates oil oxidn. Greases are classified into ten groups, with brief descriptive notes on each. V. B.

1037. Phthalocyanine lubricating greases. V. G. Fitzsimmons, R. L. Merker, and C. R. Singleterry. *Inst. Spokesman*, 1952, **16** (4), 8–17.—Recent developments in the design of elec motors, resulting in considerably higher operating temp, have necessitated the formulation of greases capable of withstanding these severe conditions. Investigations are reported using phthalocyanine pigments in combination with pet oils, silicones, aliphatic diesters, polyalkylene glycol esters, and fluorocarbons to form greases which are water resistant, shear stable, and with little tendency to oxidn at high temp. The properties of phthalocyanines are discussed in some detail, special attention being paid to the copper salt because of its comparative freedom from crystal growth under controlled conditions. Data are presented on the formation of greases with copper phthalocyanines as the gelling material and on the behaviour of such greases at high temp, in service simulated tests, and in ball bearings. Results indicate that greases so constituted have a useful field of application at temp above 150° C for extended periods, are water repellent, give long storage life, and tend to stiffen rather than soften at elevated temp. J. G. H.

1038. Protection of engines during shipping and storage. R. K. Ross. *Sci. Lubric.*, 1952, **4** (12), 10–15.—The importance of the protection of I.C. engines against rust during shipping and storage is remarked, and the causes of corrosion are briefly discussed. The development of corrosion preventives during world war II is outlined, and relevant British and American official specifications are summarized and their relationships indicated. A general classification of I.C. engine corrosion preventives is presented, and the procedures for placing engines in storage and for returning them to service after storage are detailed. J. G. H.

1039. Some phenomena of engine wear as revealed by radioactive tracer technique. H. R. Jackson, F. C. Burk, L. J. Test, and A. T. Cowell. *S.A.E. Quart. Trans.*, 1952, **6** (3), 518–30.—Piston-ring and cyl wall wear were investigated by the installation of radioactivated piston rings in the test engine. As the rings wore the debris was picked up by the lub oil, and the amount of iron from the activated ring present in the oil at any given time was determined with a Geiger counter. Problems so investigated included effect of water-jacket temp on wear, effect of air/fuel ratio on low temp wear, effect of knock on wear, effect on non-additive lub oils, and oil visc on low-temp wear, also the effect of sulphur in fuel on low-temp wear. J. G. H.

1040. Patents. U.S.P. 2,603,599 (11.7.46; 15.7.52). C. E. Trautman, assr to Gulf Research and Development Co. Foaming of oils is inhibited by adding a glycol or glycerol *A* (1 to 100 parts by wt) and sufficient of a surface active agent (1 part by wt) to lower the surface tension of *A* to or below that of the oil.

U.S.P. 2,602,050 (15.7.49; 1.7.52). R. T. Sanderson, assr to The Texas Co. Mineral lub oil containing 0·5 to 25% tetra-alkyl thioether of pentaerythritol.

U.S.P. 2,602,049 (24.12.48; 1.7.52). H. G. Smith, T. L. Cantrell, and M. L. Hill, assrs to Gulf Oil Corpn. Mineral lub oil containing a compound

$$Me_2CH{\cdot}(CH_2)_3{\cdot}O{\cdot}PO{\cdot}OCH_2CHEtBu$$
$$\quad\quad\quad

U.S.P. 2,603,600–3 ((*a*) 7.6.48; (*b*) 6.7.48; (*c*) 27.1.49; (*d*) 27.12.46; 15.7.52). H. G. Smith and T. L. Cantrell, assrs to Gulf Oil Corpn. Preparation of phosphorus and sulphur containing lub oil additives by heating a paraffinic base lub oil with anhyd $AlCl_3$ at 150° to 300° F and reacting the $AlCl_3$-free product and (*a*) 5 to 50 wt % of a $C_{<4}$-alkyl monohydric phenol, or (*b*) 10 to 75 wt % alkyl phenyl phosphite, or (*c*) 10 to 75 wt % $C_{<8}$-alkyl phosphate, with P_2S_5 at <300° F but below cracking temp. In (*d*) the $AlCl_3$-free product is heated with P_2S_5 at <450° F but below cracking temp.

U.S.P. 2,602,824 (31.3.49; 8.7.52). J. J. Padbury and E. L. Kropa, assrs to American Cyanamid Co. Liq polymeric $CFCl{\cdot}CF_2$ suitable as a lubricant is prepared by heating the monomer and 0·5 to 10 wt % di-(*tert*-butyl) peroxide and/or 2 : 2-*bis*-(*tert*-butyl-peroxy) butane in an inert gas at 150° to 450° C.

U.S.P. 2,602,048 (8.3.51; 1.7.52). A. E. Michaels and N. V. Hakala, assrs to Standard Oil Development Co. Lub oil composition of high visc and detergency contains 0·05 to 10 wt % of a copolymer of a maleate ester (10 to 16 C in ester portion) and vinyl acetate, 0·2 to 3·0 wt % of a metal salt of an alkylated phenol sulphide, and/or a phosphorus sulphide reaction product thereof, and 0·01 to 1·0 wt % of diethylene glycol monoethyl ether, methoxy triglycol, or dimethoxy tetraethylene glycol to improve compatibility.

U.S.P. 2,603,627 (6.3.48; 15.7.52). J. D. Garber and D. W. Young, assrs to Standard Oil Development Co. Preparation of a lub oil additive by condensing with a C_{5-30} halogenated aliphatic hydrocarbon a copolymer of *p*-chlorostyrene (1 to 30 wt %) and *iso*butene (mol wt >14,000) in presence of a Friedel–Crafts cat.

U.S.P. 2,604,453 (30.12.48; 22.7.52). A. H. Popkin, assr to Standard Oil Development Co. Mineral oil containing 0·1 to 15 wt %, based on total composition, of a copolymer of 80 to 95% lauryl acrylate and methyl acrylate having an average chain length of 7·5 to 10·6 C atoms, to raise the V.I.

U.S.P. 2,605,224 (24.6.49; 29.7.52). E. J. Jahn, assr to Shell Development Co. Metalworking lubricant comprising a sulphuric acid treated hydrocarbon fraction bp 300° to 700° F and 3 to 10% of lanolin, oleyl alcohol, or olein.

U.S.P. 2,602,780 (17.8.45; 8.7.52). W. A. Zisman, J. K. Wolfe, H. R. Baker, and D. R. Spessard. Hydraulic fluid consisting essentially of water and a C_{2-14} glycol or glycol ether in proportions to produce a non-inflammable mixture of min fl. pt, and as a thickener, 5 to 20 wt % of a high mol wt (<20,000) viscous copolymer of ethylene oxide and 1 : 2-propylene oxide in ratio 1–3 : 1.

U.S.P. 2,604,452 (30.12.50; 22.7.52). A. J. Morway and D. W. Young, assrs to Standard Oil Development Co. Twister ring lubricant consisting of white petrolatum and 1 to 10 wt % of an N-C_{12-22}-acyl *p*-aminophenol.

U.S.P. 2,604,450 (22.12.50; 22.7.52). A. J. Morway, D. W. Young, and D. L. Cottle, assrs to Standard Oil Development Co. Lubricant grease comprising 34 to 79 wt % of an ester of formula $R'OOCRCOOR''$ wherein R is a methylene, polymethylene, ethylidene, propylidene, or methyl dimethylene radical; R′ and R″ are like or unlike branched chain radicals of 4 to 22 C atoms, thickened with (1) a mineral oil solution of 1 to 12 wt % of a compound of formula $p\text{-}HO{\cdot}C_6H_4{\cdot}NHCOR'''$, wherein $R''' = C_{16-22}$ aliphatic hydrocarbon radical, and (2) 1 to 6 wt % of an alkali or alk earth metal soap.

U.S.P. 2,604,449 (8.3.49; 22.7.52). W. C. Bryant and A. Giordano, assrs to Swan-Finch Oil Corpn. Pet grease in which the gelation agent is an alkali metal or polyvalent metal salt of an acid of the formula $HOOC{\cdot}R{\cdot}CO{\cdot}NR_1R_2$, wherein R contains 1 to 8 C atoms and is either an alkylene radical or contains the group $\underset{|}{C}{=}CH_2$; $R_1 = C_{4-18}$ aliphatic radical; R_2 = H or R_1.

U.S.P. 2,603,604 (1.11.48; 15.7.52). S. A. Ballard, R. C. Morris, and J. L. Van Winkle, assrs to Shell Development Co. Stable synthetic lubricant comprising 90 to 99 wt % of a liq aliphatic ester of a *bis*-(hydroxyalkyl) sulphide and 1 to 10 wt % of a polymerized methacrylic acid ester of mol wt 10,000 to 25,000.

U.S.P. 2,604,486–7 ((*a*) 18.8.49; (*b*) 21.5.51; 22.7.52). C. A. Burkhard, assr to General Electric Co. Organopolysiloxane oils (*a*) containing 1·95 to 2·3 Si-bonded organic radicals per Si atom, bonded through Si–C links, 1 to 20% of the radicals

being $-(CH_2)_nSCH_2COOR$ radicals, wherein $n = 2$ or 3, R = H, lower alkyl, the remaining Si bonded radicals being saturated monovalent hydrocarbon radicals, (*b*) comprising the unit

$$(-(CH_2)SiMe_2\{OSiMe_2\}_n(CH_2)_ySCH_2CO_2(CH_2)_mO_2CCH_2S)_x$$

wherein $n = 0$ to 10, $m = \leq 2$, $y = 2$ or 3, $x = \leq 1$. V. P. P.

Bitumen, Asphalt, and Tar

1041. Bitumens and pitches as protectives. Anon. *Paint Tech.*, 1952, **17** (202), 423. Comment on the present and possible uses of bitumen and pitches for protecting surfaces. Paints based on these materials are essentially for industrial protection. Work on bitumens as protective coatings was carried out mainly in Germany. The directions in which the technology of bitumens is being developed are indicated. It seems that important technical properties of bitumen and pitch follow from the low degree of reactivity, though it also appears that many desirable characteristics of individual members can be related to the presence of non-hydrocarbon groups. Some work was done on the dielectric constant of bitumen using this as a guide to structure. Ease of emulsification and stability of emulsions vary in a manner which may be related to the content of polar groups. Evidence available suggests that the crazing and breakdown of bitumen coatings is due to oxygen attack at reactive centres. It would appear that certain highly polar solvents are capable of penetrating and " unravelling " the mol structure of some complex bitumen components. D. K.

1042. Surface phenomena on road tars. H. Mallison. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (12), 315–16.—Tar films on glass heated to 40° C remain bright after 24 hr air-cooling. The eutectic soln, in which coarse tar resins are distributed, breaks down on air-exposure due to vaporization of tar oils and naphthalene. Anthracene crystals remain embedded in the homogeneous colloidal system. The surface constitution remains practically unchanged. Similar films heated to 100° C, cooled, reheated to 40° C, and air-cooled for 24 hr appear dull. On cooling from 100° C, the strongly, fully solvatized, swollen tar resins separate out because desolvatization has not time to take place. Oil impoverishment at the surface by evaporation caused gel-resin formation, the surface is wrinkled, and anthracene crystals are visible in U.V. light. On standing the tar resumes its original condition. Surface phenomena—setting or drying—are accelerated or retarded by small additions (5%) of brown-coal tar or proprietary substances. Tests on tar films containing 0·5% of a new additive (undisclosed) are described. The small quantity added affects neither the composition nor visc, its effect on setting is > that of 15% bitumen. The val of tar-setting control in road construction is discussed. R. T.

1043. Patents. U.S.P. 2,605,193 (30.11.50; 29.7.52). R. E. Karll, assr to Standard Oil Co., Chicago. Bitumen containing 0·5 to 5 wt % of the product obtained by heating a C_{10-20} unsaturated fatty acid with 5 to 15 wt % of sulphur.

U.S.P. 2,603,592 (15.6.48; 15.7.52). H. W. Nelson, assr to Great Lakes Carbon Corpn. Production of pitch like compositions by dissolving at 300° to 650° F a normally non-fusible coke produced by non-cat pyrolysis of high boiling hydrocarbons, which coke contains $\leq 8\%$ volatile matter evolved only on carbonization and is deformable by pressure at 500° F, in an organic solvent which is liq at 300° to 650° F and boils > 500° F.

U.S.P. 2,603,573 (U.K. 23.8.45; 15.7.52). J. F. T. Blott and P. Alexander, assrs to Shell Development Co. Bituminous composition comprising, in wt %, bituminous binder 2 to 50, hydrated lime 1 to 5, acidic organic wetting agent 0·02 to 5, phenols bp < 225° C 0·01 to 10, aggregate 30 to 90. V. P. P.

Special Hydrocarbon Products

1044. Aromatics recovery by hydroforming and phenol extraction. (From a report by J. J. Swift, S. R. Stiles, E. W. Howard, and M. Tarnpoll.) *Petrol. Process.*, 1953, **8** (1), 81–7.—A new hydroforming and aromatics extraction plant built in the Argentine by Kellogg Co was originally intended, primarily, to produce nitration grade toluene.

Flexibility in design permits the production of nitration grade benzene and finished aviation gasolines.

The hydroformer equipment consists of two reactors containing the cat, the composition of which is not disclosed, wherein the conversion to aromatics is effected. Owing to coke deposition on the cat, regeneration is required. The crude aromatic concentrate is countercurrently contacted with phenol in a dist tower and the aromatic portion of the concentrate is extracted in the phenol phase. Toluene or benzene is extracted by means of acid treating followed by caustic neutralization and re-running to produce the finished nitration grade aromatic.

A re-cycle stream, consisting of a 2 : 1 ratio of diluent and fresh feed provides a control over the reaction rate in the reactors, at the same time providing additional heat input to the reactors.

Cat regeneration takes place at atm pressure, and the max allowable temp in the regenerator is somewhere in the region of 1100° F. The regeneration equipment consists primarily of a flue gas generator which serves as a source of the flue gas required to control the rate and temp of the burning operation.

The phenol extraction unit, recovering the nitration grade aromatics from the crude aromatic concentrate, uses a phenol to concentrate ratio of 6 : 1 for toluene extraction.

Capacity figures and performance data are not disclosed. J. W. H.

1045. Oil-inherent antioxidants. W. Ruttenstorfer and A. Schafler. *Erdöl u. Kohle*, 1953, **6**, 65–6.—Series of acid + clay refined transformer oils was separated into three fractions, neutral oil (= paraffins + naphthenes), resins, asphalt, by passage through an adsorber column packed with Al_2O_3. Oxidn resistance of oil (as measured by VDE (Kissling) tar No.) was proportional to resin content in range of 0·08 to 0·20% of latter. This relationship can be used for plant control purposes to predict Kissling val from resin content, since adsorption analysis (6 hr) is much more rapid than oxidn test (85 hr overall). Addition of separated resin to oils of high tar No. causes this to decrease, although such decrease is less than the calc value. V. B.

1046. Evaluating cutting oils by determining their effectiveness in reducing sub-surface grain distortion. W. E. Lauterbach and E. A. Ratzel. *Lubric. Engng*, 1952, **8** (5), 238–40, 261–3.—Data are presented of an experimental evaluation of the effectiveness of cutting oils in reducing cold work, X-ray diffraction being employed to measure the depth of the distorted grain structure in steel specimens, planned under a variety of conditions. Basic relationships for the depth of cold work as effected by rake angle, depth of cut, and cutting speed are obtained for dry cutting with five oils. As expected, depth of the cold work decreases with increasing rake angle, and increases with increasing depth of cut. While any one of the oils reduced the depth of cold work as compared to dry cutting, only at low cutting speeds, of the order of 2·5 f.p.m. were there significant differences obtained between the oils.

A comparison of the experimental evaluation was made with an independent field rating in which the largest depth of cold work accompanied the least effective oil, the smallest depth of cold work being found with the most effective oil. It is accordingly concluded that depth of cold work determinations afford an effective lab method for the evaluation of cutting oils for use in low-speed machinery operations. J. G. H.

1047. Carbide steel milling with cutting fluids—a progress report. J. R. Roubik. *Lubric. Engng*, 1952, **8** (5), 235–7, 261.—Carbide face-milling tool-life tests on four medium-carbon steels of hardness of approximately 200, 300, and 400 Bhn with various applications of a water-soluble oil emulsion are reported. Hardness can be used as a rough index or guide in the selection of cutting speeds and feeds. In the tests reported, application of a water sol oil emulsion to the carbide milling of steel in any of the customary manners, and even more so with the cutter completely immersed, was not only inconvenient but actually resulted in decreased tool life and showed no improvement in surface finish. In addition, tool failure was much more likely to be of a type which would be expensive to repair. J. G. H.

1048. Patents. U.S.P. 2,605,207 (11.1.49; 29.7.52). N. L. Drake, C. M. Eaker, and W. J. Shenk, assrs to U.S.A. (Secretary of the Army). Insect repellent composition

comprising the *cyclo*hexyl or *cyclo*pentyl ester of 1-hydroxy *cyclo*hexane acetic acid, *cyclo*hexyl ester of 1-hydroxy *cyclo*pentane acetic acid or the *cyclo*hexyl ester of 1-hydroxy*cyclo*hexane carboxylic acid, and a carrier.

U.S.P. 2,605,208 (7.1.49; 29.7.52). P. D. Bartlett and H. J. Dauben, assrs to U.S.A. (Secretary of the Army). Insect repellent composition comprising an *N*-acyl substituted 1 : 2 : 3 : 4-tetrahydroquinoline or -tetrahydrcquinaldine (acyl = 2 to 4 C), and a carrier.

U.S.P. 2,605,206 (France 30.12.46; 29.7.52). L. Rouzet, assr to Soc. des Laboratoires de Recherches pour Applications Industrielles. Wood preservative comprising 1 pt by wt creosote oil, 2 pt by wt of anthracene oil containing *p*-chloro-*m*-cresol, trichlorophenol, trichlorocresol, or pentachlorophenol, and a pet hydrocarbon.

U.S.P. 2,603,560 (3.12.47; 15.7.52). W. D. Stewart, assr to B. F. Goodrich Co. As plant growth regulant is used a diester of an acid with 1–16 acyclic C, an alkenyl radical as one alcohol residue and as the other alcohol residue a C_{1-10} alkyl, alicyclic, alkenyl, aryl, or aralkyl radical or its mono-chloro derivative.

U.S.P. 2,602,090–1 ((*a*) 5.7.51; (*b*) 2.1.51; 1.7.52). R. C. Dosser and A. E. Colby, assrs to Dow Chemical Co. Purifying: (*a*) phenoxy-aliphatic-monocarboxylic acids which may contain a single Cl, Br, alkyl, or aryl nuclear substituent; (*b*) polychlorophenoxy-aliphatic monocarboxylic acids, by treating the alkali metal salt with an alkali hypochlorite. V. P. P.

Derived Chemical Products

1049. Detergent action. N. K. Adam and D. G. Stevenson. *Endeavour*, 1953, **12**, 25–32.—Some modern work is described on the action by which detergents dislodge oil and dirt from a solid surface and hold it in suspension so that it can be easily washed away. Three mechanisms of detergent action, the " rolling-up " action, dispersion of the detached oil in foam, and emulsification, are described. The " rolling-up " action, brought about by the adsorption of the detergent at the solid–water and oil–water surfaces, is shown in a diagram and by photomicrographs. Solubilization, micelle formation, ionic structure, myelinic forms and complexes, and the effect of polar groups, temp, and a new non-ionic detergent are described and discussed. Sixteen photomicrographs illustrate the actions of various types and conc of detergents and various oils and dirts. W. H. C.

1050. The du Pont story—research. V. B. Guthrie, ed. *Petrol. Process.*, 1953, **8**, 1, 92–4.—In 1951 du Pont Co. spent $47 million on research; the average cost to maintain one technically trained man in research is estimated to be $24,000 a year.

Extensive research by du Pont started in 1922 when a process for the production of tetraethyl-lead (TEL) needed to be developed. Dye research led to the development of the ethyl chloride method for making TEL. During the past twenty-five years over 2000 million lb of TEL compounds have been produced.

Research investigations range from studies of fuel oil deterioration to the knock reaction and the mechanism of deposit flaking in engine cylinders. Petrochemicals are now the subject of an extensive research programme in the du Pont organization. J. W. H.

1051. Patents. U.S.P. 2,605,293 (26.4.51; 29.7.52). F. T. Tymstra, assr to Shell Development Co. In production of glycerine by hydrolysis of dichlorhydrin isomers *A*, *ca* 20 to 75% of the aq soln of *A* is diverted through a unit in which *A* is converted to epichlorhydrin *B*, *B* then being mixed with undiverted *A* and the mixture hydrolysed The load on the glycerine evaporator is thereby reduced.

U.S.P. 2,602,822 (23.7.51; 8.7.52). C. G. Schwarzer, S. A. Ballard, and D. B. Luten, assrs to Shell Development Co. Production of *bis*-(hydroxyphenyl) compounds by reacting a $C_{<3}$ vinyl-type halo-olefin with a phenol in an acidic medium.

U.S.P. 2,602,821 (23.7.51; 8.7.52). D. B. Luten, S. A. Ballard, and C. G. Schwarzer, assrs to Shell Development Co. Production of *bis*-(hydroxyphenyl) compounds by reacting a thiol with a phenol in an acidic medium.

U.S.P. 2,603,645 (Neth. 23.2.44; 15.7.52). H. Hoog and W. F. Engel, assrs to Shell Development Co. Production of β-picoline by contacting a mixture of allyl alcohol and a mol excess of ammonia with an alumina–copper cat at 300° to 500° C. In U.S.P. 2,605,264 the reaction is carried out at a rate of <3 kg allyl alcohol/litre cat/hr while in indirect heat exchange with a liq heat controlling medium.

U.S.P. 2,602,819 (20.3.47; 8.7.52). M. E. Huscher, M. W. Long, and J. C. Moore, assrs to Dow Chemical Co. Production of polyálkanolamines by contacting a lower olefin oxide with an anhydrous alkanolamine at 0° to 100° C in absence of a solvent or of ammonia.

U.S.P. 2,603,650 (25.7.47; 15.7.52). L. Schmerling, assr to Universal Oil Products Co. Production of heterocyclic compounds by heating a 1 : 5-dihalo-3 : 3-dialkylpentane with a binary compound of a metal and a non-metal of Group VI in water at 150° to 300° C.

U.S.P. 2,604,479 (5.8.49; 22.7.52). W. F. Rollman, assr to Standard Oil Development Co. Production of phthalic anhydride by passing a vaporized aromatic compound at $<550°$ F into a reaction zone, where it is contacted with an oxidation cat suspended in an oxygen-containing gas at 800° to 1100° F for a contact period of <1 sec, the reaction product then being separated from cat and cooled to $<800°$ F, the cat being reactivated and recycled. V. P. P.

U.S.P. 2,606,156 (9.6.50; 5.8.52). E. Davis, assr to Purex Corpn. Fluid aq slurry of a synthetic sulphated or sulphonated water-sol detergent is de-aerated at subatmospheric pressure and then dried to produce a solid detergent in a separate zone. The de-aeration step gives a higher density product.

U.S.P. 2,607,740 (3.5.50; 19.8.52). P. T. Vitale and R. S. Leonard, assrs to Colgate–Palmolive–Peet Co. Conc liq detergent consisting of a water-sol salt of a sulphate or sulphonate with an aliphatic chain of 8 to 22 carbon atoms and a dialkylolamide.

U.S.P. 2,607,741 (26.12.47; 19.8.52). J. W. Arkis and D. I. Walker, assrs to Standard Oil Co. Emulsifiable cleansing comp comprising a sodium soap of mahogany acids, a sodium rosin soap, and a cat reformed naphtha bottoms boiling between 400° and 750° F.

U.S.P. 2,608,570 (19.10.48; 26.8.52). D. Harman, assr to Shell Development Co. *tert*-Butyl peracetate.

U.S.P. 2,608,571 (2.12.49; 26.8.52). F. F. Rust, A. R. Stiles, and W. E. Vaughan, assrs to Shell Development Co. Peresters of peroxycarboxylic acids.

U.S.P. 2,608,586 (13.12.48; 26.8.52). S. A. Ballard, R. C. Morris, and J. L. Van Winkle, assrs to Shell Development Co. Ethers of allyl-type alcohols with halogen-containing substituted carbinols.

U.S.P. 2,608,587 (7.4.50; 26.8.52). R. C. Morris and J. L. Van Winkle, assrs to Shell Development Co. β,γ-olefinic ethers of halohydrins. J. M. S.

Ger.P. 855,703, 18.9.52. B. Christ, F. Hannusch, and A. Sieb, assrs to Bad. Anilin- & Soda-Fabr. Method for producing olefin oxides.

Ger.P. 855,250, 11.9.52. Bad. Anilin- & Soda-Fabr. Process for obtaining pure acetone.

Ger.P. 854,510, 4.9.52. B. Jüttner and W. Lange, assrs to Kohlentechnik G.m.b.H. Method for producing benzenecarboxylic acids.
BrennstChemie, 1952, **33** (19–20). R. T.

Coal, Shale, and Peat

1052. Synthetic liquid fuels. Annual Rept. Secretary of Interior for 1952. Pt 1—oil from coal. *Rep. Invest. U.S. Bur. Min.* 4942, Jan. 1953.—Research and development at the Bureau of Mines establishments during 1952 are described. Liq- and vapour-phase hydrogenation of several coals are reported. Work on the gas-synthesis plant is described, and the characteristics of the diesel oil and the Perco treated gasoline from Fischer–Tropsch run No 2 are reported. Investigations on the production of liq fuels from synthesis-gas are described covering: process development, pilot and

bench scale operations, the cat-oil-slurry process, fixed-bed activity tests, mechanism of synthesis, refining of products. The synthesis of liquid fuels by the hydrogenation of coal is described from the aspects of fluidized hydrogenation, kinetics of hydrogenation, and characterization and separation of products. The development of processes for production of synthesis gas from coal is reported. The results of operations on the pulverized-coal gasifier at increasingly higher pressures up to 450 psi has shown that increased throughputs are possible. A new process for removal of carbon dioxide from synthesis gas is reported. Significant progress has been made in developing a sturdy long-life Fischer–Tropsch cat. New underground systems for coal gasification are described that permit a steady production of combustible gas for periods up to three months. W. H. C.

1053. Infra-red spectra of coal and coal products. C. G. Cannon. *Nature, Lond.*, 1953, **171**, 308.—Describes the infra-red spectra of bright coals of varying rank. The general similarity in the spectra of all ranks (except anthracite) suggests that the mol skeleton remains almost unchanged, but bands due to OH, C=O, C–O–, etc., decrease in intensity with increase in rank. The OH groups are mainly phenolic. Single ring and condensed aromatic structures and aliphatic CH_2 and CH_3 groups can be detected.

Pyridine and pitch extracts exhibit structures similar to those of coal itself, but humic acid spectra differ considerably. H. C. E.

1054. The recovery of coal by-products from coke oven gas. F. Rosendahl. *Bitumen, Teere, Asphalte, Peche*, 1952, **3** (12), 320–2.—Important tech problems in removal of excess heat during reaction, to retain temp at optimum synthesis val for hydrocarbon production in coke ovens, are discussed and supported by diagrams. Tar separation, recovery of ammonia and hydrogen sulphide from the gas are discussed in detail. R. T.

1055. Patent. Ger.P. 855,452, 11.9.52. K. Bayerie, assr to F. J. Collin A.G. Process for scrubbing ammonia from gases, *e.g.*, coal dist gases.

BrennstChemie, 1952, **33** (19–20). R. T.

Miscellaneous Products

1056. Evolution and application of butyl. R. J. Adams and E. J. Buckler. *I.R.I. Trans.*, 1953, **29**, 17–31.—The history of development of butyl is reviewed from the early work on ionic polymerization to the commercial production from *iso*butylene by the Standard Oil Development Co. in 1933, and through the war years under the synthetic rubber programme. Production figures are given over the years 1943–51, at Baton Rouge, Baytown, and Sarnia. A brief account is given of the characteristics of ionic polymerization as applied to butyl production and of the fundamental and commercial characteristics of the various grades of this polymer now manufactured. Details are given of the manufacture of inner tubes, the main application of butyl, and its increasing use in the production of proofed goods, in electrical insulation, and automobile mechanical products. Some recent applications are summarized. W. H. C.

1057. Fluorescent and magnetic inks for flaw detection. Anon. *Mech. World*, 1953, **133** (3403), 59.—Three fluids for non-destructive flaw detection are described, and methods of application given. The first is an electro-magnetic ink for the detection of internal and surface flaws in magnetizable metals; the second is a fluorescent ink for crack detection of light metals, non-ferrous alloys, stainless steels, and plastics; the third is a fluorescent magnetic ink. T. T.

1058. Mould growth on painted surfaces. Its cause, its diagnosis and its prevention. A. Minich and M. Goll. *Paint Tech.*, 1952, **17** (202), 426.—Procedures involved in the diagnosis of moulds on painted surfaces are discussed. Paint chips may be examined first with the stereoscopic microscope, which gives the general picture and enables the identification of certain forms. The chips are then studied with the standard microscope by both incident and vertical illumination.

Correct paint formulation and addition of fungicide to paint combat the problem of mould growth. Some paint formulations encourage fungal growth, because the paint can serve as food for the fungi. Most common pigments are inert to fungus growth, but zinc oxide is an inhibitor. Some extended pigments create an adverse condition for mould growth, due to the high degree of alkalinity they impart to a paint film. Vegetable oils, the most common type of paint vehicle, can serve as food for the mould. Tung oil is the most resistant. The degree of nutrition contributed by oil vehicles depends on the method of refining or processing used. No experimental evidence is available that driers, in concentrations normally employed, have any effect on mould resistance. The most popular fungicides used are the aryl mercury salts of carboxylic acids. Naphthenates are very effective, and cresol mercury naphthenate appears to be the most promising. The min amount for effective resistance to mould growth is 0·25%, based on the total wt of finished paint. D. K.

1059. Lindane converters for insect control. G. S. Hensill and S. J. Leland. *Soap, N.Y.*, 1952, **28** (11), 119.—Possible hazards due to lindane vaporizers are discussed and illustrated by ref to experiments on lindane absorption by food (milk, bread, potatoes, pie crust, and cucumbers). The authors find little evidence of toxicity as a result of lindane inhalation and ingestion. M. V. J.

1060. Automotive fleet cleaning. E. Weller. *Soap, N.Y.*, 1952, **28** (11), 44.—The cleaning routines of a taxi-cab and two bus companies are described briefly. Costs and quantities of material used and wage costs are noted. M. V. J.

1061. The detection of additives in vegetable waxes. The use of instrumental analysis. C. J. Marsel, C. S. Treacy, H. Brenner, and F. De Long. *Soap, N.Y.*, 1952, **28** (11), 127.—The paper discusses the value of refractive index for detection of additives in waxes.

Tests on nineteen carnauba wax samples showed the refractive index at 100° C to vary between 1·4457 and 1·4478. Tests on "Durez 219" resin–carnauba wax mixtures established an almost linear relationship between composition and refractive index. If the refractive index of the additive is known, the percentage in the wax can be calculated. Studies were made of carnauba wax containing 5% common additives, the refractive indices differed significantly from that of pure carnauba. More conclusive results were obtained by concentrating the additive using a solvent leaching technique. M. V. J.

1062. Metal cleaners, Pt II. M. A. Lesser. *Soap, N.Y.*, 1952, **28** (11), 46.—Alk spray cleaners, electrocleaners, solvent cleaners, "diphase" cleaners and acid cleaners are surveyed. 56 refs are included. M. V. J.

1063. Antiseptic skin cleansers. M. M. Maglio and J. M. Hannegan. *Soap, N.Y.*, 1952, **28** (11), 38.—An industrial powdered skin cleanser was prepared containing 0·65% of 2 : 2′-dihydroxy-3 : 5 : 3′5′-tetrachloro-diphenylmethane (VL-1) or hexachlorophene (G-11), and its antibacterial activity compared with (*a*) the powder without the germicide, (*b*) toilet soap, (*c*) liq hospital soap containing 0·75% hexachlorophene diluted 1 : 2 with water.

Results of practical handwashing trials are presented in tabular and diagrammatic form. The powdered unmedicated cleanser was found to be superior to the bar soap. The antiseptic powder was 60% more efficient than the powder without the germicide, and similar in performance to the liquid antiseptic soap. The VL-I cleanser and G-11 cleanser were equivalent in degerming properties. 15 refs are included. M. V. J.

1064. Metal complexing agents in soap and detergent products. H. W. Zussman. *Soap, N.Y.*, 1952, **28** (11), 79.—The chemistry and action of metal complexing compounds in preventing precipitation of insol compounds is discussed. Uses are reviewed with particular ref to E.D.T.A. (ethylenediamine tetracetic acid). A table shows the effect of E.D.T.A. on soil removal properties of representative synthetic detergents. It is concluded that improvement in detergency cannot be explained completely in terms of water softening or complex formation. 16 refs are included. M. V. J.

1065. The gas checking of stoving finishes containing various alkyds. L. R. Rogers. *J. Oil Col. Chem. Ass.*, 1953, **36** (393), 95.—The tendency of stoving finishes based on alkyds to gas check when stoved was investigated. The apparatus used and procedure followed are described. Photographs showing the gas checking of various resins are included. The effect of amino resins, temperature and air drying on gas checking, the cause of gas checking, effect of acetylene and ozone are considered. Ozone was found to induce gas checking in certain alkyd resins. Checking can be prevented by addition of certain additives, *e.g.*, β-naphthol, diphenylguanidine, anthroquinone, hydroquinone, or of small quantities of metallic driers.

It is suggested that the easiest way of preventing gas checking in stoving finishes is to base them on alkyds made from saturated fatty acids. D. K.

1066. Factors affecting the heat thickening of linseed oil. A. J. Seavell and J. C. Sleightholme. *J. Oil Col. Chem. Ass.*, 1953, **36** (393), 119.—The preliminary results are reported of laboratory work undertaken to assess the practical and theoretical significance of each of the following factors in the heat thickening of linseed oil: type of vessel, access of air, blowing with inert gas, low pressure, stirring, loss in wt and temp. Some of these factors are interconnected. The apparatus and oils used in these experiments, which were carried out in both open and closed systems, are described. The rate of thickening of linseed oil under various conditions was found to be influenced mainly by the access of atm oxygen which accelerates thickening and causes darkening. Neither vac nor inert gas seem to have any great effect on the thickening rate. Under closed conditions the acid val tend to be high, but they can be reduced by use of vac or blowing with inert gas. Removal of more volatile constituents does not, to any great extent, accelerate the heat of polymerization of linseed oil. D. K.

1067. Problems in formulating polyvinyl acetate emulsion paints. A. C. Fletcher. *J. Oil Col. Chem. Ass.*, 1953, **36** (392), 49.—Vinyl acetate monomer is prepared from acetylene and acetic acid either by liq or vapour phase synthesis. To carry out the polymerization step for emulsions, the monomer is dispersed in water containing protective colloids, surface active agents and buffers, and the dispersion is subjected to heat in the presence of a cat. It is usual to plasticize the emulsion after polymerization, and the normal procedure is to pour the plasticizer into the well agitated emulsion at temperatures up to 50° C.

Properties of polyvinyl acetate films are discussed. The formulation of polyvinyl acetate emulsion paints is considered with reference to opacity, covering power, brushability, uniformity of finish during application, can stability, and performance as decorative finishes. D. K.

1068. Patents. U.S.P. 2,603,606 (Neth. 3.2.47; 15.7.52). S. L. Langedijk and P. N. Degens, assrs to Shell Development Co. Gelling or crystallization of 20 to 30% aq soln of sodium C_{8-20} alkyl sulphates and ≤2% Na_2SO_4, is inhibited by adding KCl, KNO_3, or K_2SO_4 in amount to give K : Na = 0·3–1 : 1.

U.S.P. 2,602,781 (5.1.49; 8.7.52). L. R. Bacon, C. E. Smith, and T. H. Vaughn, assrs to Wyandotte Chemicals Corpn. Detergent comp consisting of sodium C_{9-16} alkylbenzene sulphonate and 1 to 63 wt % of hydroxyethylcellulose.

U.S.P. 2,604,461 (22.7.50; 22.7.52). H. H. Roth, assr to Dow Chemical Co. Production of sulphonated alkenyl aromatic resins by immersing a film of the resin, 0·01 to 0·05 inch thick, in 90 to 100% H_2SO_4 at 140° to 200° C for 5 to 60 min until insol in water, and then removing free acid from the resin.

U.S.P. 2,603,622 (Ger. 1.10.48; 15.7.52). H. Berger and R. Linke. Halogen containing resin stabilized with an acetylenic alcohol.

U.S.P. 2,604,458 (2.6.50; 22.7.52). C. B. Havens, assr to Dow Chemical Co. Stabilizing vinylidene chloride–vinyl chloride copolymers containing traces of benzoyl peroxide cat residue by adding catechol, resorcinol, quinol, or *p-tert*-butyl catechol, and $Na_4P_2O_7$ or Na_2HPO_4.

U.S.P. 2,604,459 (4.12.50; 22.7.52). E. M. Jankowiak, assr to Dow Chemical Co. Finely divided virgin polymer containing ≤10% of vinyl or vinylidene chloride is wetted with an acidified aq solution of an alkali metal pyrophosphate, orthophosphate,

or phosphite as stabilizer, then separated while containing 0·05 to 2 wt % of the stabilizer and dried.

U.S.P. 2,604,460 (19.8.49; 22.7.52). G. M. Mack, assr to Advance Solvents & Chemical Corpn. Heat and light stabilized polyvinyl resin containing a compound of formula $RO\cdot(SnR''_2O)_nR'\cdot SnR''_2X_2$, wherein R and R′ = H or alkyl; R″ = alkyl or aryl; X = Cl or Br; n = 3 to 10.

U.S.P. 2,603,621 (27.11.50; 15.7.52). A. B. Craig and E. W. Gluesenkamp, assrs to Monsanto Chemical Co. Dyeable fibre forming comp comprising a blend of 70 to 98% of a copolymer of acrylonitrile with up to 25% of another monomer, and 2 to 30% of a copolymer of *N*-vinylimidazole with up to 70% of another monomer.

U.S.P. 2,604,457 (Can. 3.3.49; 22.7.52). G. H. Segall and J. F. Clemow, assrs to Canadian Industries Ltd. Styrene–acrylic acid copolymers reacted with polymeric 4-vinyl*cyclo*hexene diepoxide.

U.S.P. 2,603,611 (25.10.48; 15.7.52). P. E. Marling, assr to Monsanto Chemical Co. Coating comp comprising (*a*) 25 to 90 wt % of a copolymer of 25 to 75 wt % of a fatty acid-containing natural drying oil and 75 to 25 wt % styrene, vinyldiphenyl, *iso*propenyldiphenyl, α-methyl styrene or mixtures thereof, and (*b*) 10 to 75 wt % of vinyl esters of tall oil acids.

U.S.P. 2,603,616 (28.1.48; 15.7.52). L. W. Newton, assr to Union Carbide and Carbon Corpn. Plastic comp comprising a vinyl resin containing ⩽85% vinyl halide, a cellulose ester of a C_{2-4} fatty acid, and as a plasticizer, a tetra-alkyl or tetrabenzyl ester of a thio-*bis*-dicarboxylic acid or a hexa-alkyl ester of a saturated thio-*bis*-tricarboxylic acid, each alkyl containing 1 to 10 C atoms, and said acids containing only C, H, O, and S.

U.S.P. 2,603,617 (30.8.46; 15.7.52). E. O. Hook and E. W. Cook, assrs to American Cyanamid Co. Plasticizing natural and synthetic elastomers with *n-iso*propyl thio-salicylamide or its amine or zinc salt.

U.S.P. 2,603,615 (24.6.49; 15.7.52). J. Dazzi, assr to Monsanto Chemical Co. Vinyl chloride resins plasticized with esters of phenyl phenoxy acetic acid.

U.S.P. 2,603,619 (23.2.50; 15.7.52). J. Dazzi, assr to Monsanto Chemical Co. Vinyl chloride resins plasticized with di-$C_{<11}$-alkyl *bis*-phenoxy acetate.

U.S.P. 2,602,785 (30.9.50; 8.7.52). Q. T. Wiles and D. W. Elam, assrs to Shell Development Co. Impact strength of glycidyl polyethers of dihydric phenols after curing is improved by incorporating a polyvinyl ester of a saturated fatty acid (polyvinyl acetate).

U.S.P. 2,604,423 (6.10.44; 22.7.52). O. C. Slotterbeck, W. H. Smyers, and D. W. Young, assrs to Standard Oil Development Co. Laminated sheet material consisting of two sheets of regenerated cellulose with an intermediate layer of a styrene–*iso*butylene copolymer of intrinsic visc >0·6 and combined styrene content of 50 to 70%.

U.S.P. 2,603,576 (2.11.45; 15.7.52). A. A. Cook, N. C. Shane, and E. B. Whitworth, assrs to Arkansas Co. Waterproofing textiles by processing first in an aq bath of a wax and a soap, then in an aq bath of dil acid and a water sol polyvalent metal salt, at least one bath containing a water-sol cellulose derivative and/or a water-sol aldehyde resin precondensate, and then drying.

U.S.P. 2,602,739 (Neth. 14.4.43; 8.7.52). H. J. Tadema, assrs to Shell Development Co. Paper sizing comp consisting of an aq emulsion of pH 8 to 9 of 10 to 20 parts of colophony (90 to 100% saponified) and 90 to 80 parts of an Edeleanu extract.

U.S.P. 2,603,571 (19.12.49; 15.7.52). W. Castellano, assr to Union Oil Co. of California. Mastic floor composition comprising the product obtained by esterifying a mixture of tall oil pitch and an acid obtained by air-blowing paraffin wax until acid No is 200 to 260 mg KOH/g with a polyhydric alcohol of ⩽3 OH groups.

U.S.P. 2,604,411 (10.7.50; 22.7.52). W. C. Riddell and G. B. Kirk, assrs to Henry J. Kaiser Co. Production of a water repellent gypsum product by intimately mixing an aq slurry of calcined gypsum with 0·5 to 2·0% on (dry wt) of pet wax as an aq emulsion and 2 to 10% (on dry wt) of residual fuel oil, pine tar, or coal tar. V. P. P.

U.S.P. 2,605,508–9 (10.8.45;5.8.52). R. R. Driesbach, assr to Dow Chemical Co. Rubber-like elastic thread is made by the dry extrusion of a comp consisting of a copolymer of a mixture of a lower aliphatic conjugated diolefin, an α-methylene lower alkyl cyanide or aromatic compound, and a lower alkyl α-methylene lower alkyl ketone, together with rubber-compounding and vulcanizing agents, and curing the extruded thread.

U.S.P. 2,606,161 (24.11.48; 5.8.52). P. E. Marling, assr to Monsanto Chemical Co. Copolymer of 15 to 50 wt % styrene, 10 to 25 wt % α-methylstyrene, *iso*propenylbiphenyl or α-*p*-dimethylstyrene and 25 to 75 wt % of an unsaturated alkyd resin prepared by condensation of a polyhydric alcohol, a drying oil carboxylic acid, a dicarboxylic acid, and an aromatic monocarboxylic acid.

U.S.P. 2,606,162 (U.K. 30.1.48; 5.8.52). D. H. Coffey, O. B. Edgar, T. J. Meyrick, and T. J. Watts, assrs to I.C.I. Ltd. Comp comprising 20 to 100 parts by wt of a hydrocarbon poly*iso*cyanate-modified polyester of a glycol and a dicarboxylic acid having a mol wt >10,000 and 100 parts by wt of polyvinyl chloride or an interpolymer of vinyl chloride with another mono-olefinic compound.

U.S.P. 2,606,166 (19.7.50; 5.8.52). T. M. Patrick, assr to Monsanto Chemical Co. Softeners for natural rubber or rubbers derived from 1 : 3-butadiene are the phenylhydrazones of 2- or 3-thiophenecarboxaldehyde or 2- or 3-thianaphthenecarboxaldehyde or nuclear substituted derivatives thereof.

U.S.P. 2,606,167 (30.12.49; 5.8.52). S. J. Hetzel, assr to Sun Oil Co. Polyvinyl formal, acetal, butyral, or acetate resins are plasticized with 1 : 5-pentanediol difuroate.

U.S.P. 2,606,168 (29.5.50; 5.8.52). G. E. Ham, assr to Monsanto Chemical Co. Soln of acrylonitrile polymers in tetrakis (*N* : *N*-dimethylamido) pyrophosphate.

U.S.P. 2,606,169 (23.2.51; 5.8.52). C. Roney, assr to Ansul Chemical Co. Olefin–sulphur dioxide resins are stabilized by diphenyl phenylphosphinate.

U.S.P. 2,606,170 (31.12.49; 5.8.52). S. J. Hetzel, assr to Sun Oil Co. Polyvinyl acetal, butyral, and acetate resins are plasticized with 1 : 5-pentanediol-*bis*-*cyclo*hexyl acetate.

U.S.P. 2,606,171 (30.12.49; 5.8.52). S. J. Hetzel, assr to Sun Oil Co. Polyvinyl acetal, butyral, and acetate resins are plasticized with 1 : 5-pentanediol diesters of acids obtained by partial oxidation of kerosine.

U.S.P. 2,606,172 (21.5.48; 5.8.52). P. O. Tawney, assr to United States Rubber Co. Acetone-sol unsaturated interpolymers of a di-2-alkenyl maleate, styrene, and a 2-alkenyl alcohol.

U.S.P. 2,606,175 (12.4.51; 5.8.52). J. A. Price, assr to American Cyanamid Co. Copolymers of 2-vinylbenzimidazole and another vinyl compound.

U.S.P. 2,606,884 (27.4.50; 12.8.52). E. E. Mayfield, assr to Hercules Powder Co. Adhesive comprising a resinous extract of pine wood and a copolymer of butadiene and acrylonitrile.

U.S.P. 2,606,886 (16.10.48; 12.8.52). L. O. Amberg, assr to Hercules Powder Co. Conjugated diolefin polymers are preserved by vulcanizing them in the presence of a terpene-substituted phenol.

U.S.P. 2,606,890 (15.12.49; 12.8.52). O. L. Polly and O. D. Cunningham, assrs to Union Oil Co. Modified alkyd resin prepared by reacting a polycarboxylic acid or anhydride thereof, a naphtha-insol acidic fraction made by oxidizing paraffin wax, and a polyhydric alcohol.

U.S.P. 2,607,752 (2.1.51; 19.8.52). W. W. Crouch and J. F. Howe, assrs to Phillips Petroleum Co. Resin comp consisting of a nitrile boiling above 250° F and having a mol wt between 80 and 1000, and an unsaturated organic compound–sulphur dioxide resin.

U.S.P. 2,607,753 (23.5.50; 19.8.52). J. W. Adams, assr to United States Rubber Co. Method of coagulating butadiene rubber latex containing carbon black and a surface-active dispersing agent by mixing with an acid or polyvalent metal salt and then adding a polyethylene polyamine.

U.S.P. 2,607,758 (22.11.48; 19.8.52). J. C. Hillyer, assr to Phillips Petroleum Co. A resinous product is made from furfural by heating it, mixed with 0·5 to 20 wt % of morpholine, at 200° to 500° F.

U.S.P. 2,607,764 (28.11.47; 19.8.52). J. F. Nelson and L. M. Welch, assrs to Standard Oil Development Co. A solid interpolymer of 10 to 70% butadiene and 90 to 30% *iso*butylene. The interpolymer has a Wijs iodine number between 60 and 165 and a Staudinger mol wt between 30,000 and 100,000.

U.S.P. 2,608,544 (28.12.49; 26.8.52). P. L. Brandt, assr to Pan American Refining Corpn. Butadiene–acrylonitrile rubber is plasticized with a methyl butyl naphthalene. J. M. S.

Corrosion

1069. Don't let corrosion eat up your profits. D. H. Carpenter. *World Oil*, 1.2.53, **136** (2), 172.—Causes of corrosion include hydrogen sulphide and carbon dioxide content in produced fluid, and electrolytic effects. It is recommended that the rate of corrosion be observed, and, correlating these data with the extent of preventive measures, the optimum frequency of preventive measures deduced. The use of alloy stills for tubing, etc, is not recommended on a basis of cost. More economical methods are the application of inhibitors or neutralizers. The inhibitors may be applied in stick or in liq form. A. J. H.

1070. Lead and lead alloys. K. H. Roll. *Chem. Engng*, 1953, **60** (2), 264–80.—Resistance to corrosion, and forms of plant fabrication. D. M.

1071. NACA studies of mechanism of fretting (fretting corrosion) and principles of mitigation. D. Godfrey and E. E. Bisson. *Lubric. Engng*, 1952, **8** (5), 241–3, 262–3.—NACA research on fretting corrosion conducted at Lewis Flight Propulsion Lab is reported. Microscopic observation and colour motion micrographs were used with glass and other non-corrosive materials as well as metals for specimens. Observations and analyses pointed to the conclusions that fretting is the result of the removal of finely divided and apparently finely divided material due to inherent adhesive forces between the surfaces. The fretting of non-corrosive materials indicates that oxidation as a cause is a secondary rather than a primary factor. Studies of methods of inhibition of fretting indicate that MoS_2 can be quite effective in delaying the start of fretting if the coating of MoS_2 is properly applied. MoS_2 is particularly effective because of its capability of reducing metallic adhesion at the contact areas. J. G. H.

1072. Patents. U.S.P. 2,602,779 (11.9.47; 8.7.52). M. I. Moyer and J. M. Hersh, assrs to Cities Service Oil Co. Metals exposed to oil well brines containing corrosive sulphur compounds are protected by adding diethyl thiourea to the brine.

U.S.P. 2,602,760 (18.7.50; 8.7.52). J. M. Michel and K. F. Hager, assrs to U.S.A. (Secretary of the Army). Anti-corrosion comp comprising an aq emulsion of pH <7 containing $\leqslant 0{\cdot}1\%$ of an alkyl ($C_{\leqslant 5}$) sulphamidocarboxylic acid or a salt thereof.

U.S.P. 2,604,451 (16.9.48; 22.7.52). A. G. Rocchini, assr to Gulf Research and Development Co. Mineral oil containing as a corrosion inhibitor a minor amount of an amide formed by condensing an amine with a malonic acid having a $C_{\leqslant 6}$ alkyl substituent. V. P. P.

U.S.P. 2,606,155 (26.11.46; 5.8.52). W. H. Hill, assr to Koppers Co. Cleaning and pickling comp for removing corrosion products from metals comprises a pickling acid soln containing a reaction product of an aldehyde with a thiocyanate of a heterocyclic nitrogen base.

U.S.P. 2,607,564 (8.10.49; 19.8.52). W. D. Yerrick, assr to Air Preheater Corpn. Corrosion control in two-pass regenerative heaters.

U.S.P. 2,607,744 (18.7.49; 19.8.52). P. S. Viles, assr to Standard Oil Development Co. Corrosivity of aq media on ferrous metals is reduced by addition of a reaction product made by adding an amine to an aq soln of an acidic chromium salt at 60° to 100° F.

U.S.P. 2,608,518 (25.7.51; 26.8.52). R. L. Greene, assr to Standard Oil Development Co. Corrosion in the solvent stripping zone of solvent dewaxing plants is prevented by passing a portion of the flue gas circulating in the filtering step to the top of the solvent stripping zone. J. M. S.

Engines and Automotive Equipment

1073. Marine oil engines—a new era. Anon. *Times Rev. Ind.*, 1953, **7** (74), 26–8.—Need for higher power for increased size of merchant shipping (especially tankers) is being met by Diesel engine industry by supercharging. Burmeister and Wain exhaust turbo-charger two-stroke six-cyl engine has power/wt ratio of 115 lb/bhp at 8000 bhp with estimated fuel consumption of 0·36 lb/bhp/hr; brief description of engine and turbo-charger equipment is given. Werkspoor two-stroke four-cyl engine under construction has had power increased from 1800 to 2400 bhp by supercharging, giving wt/bhp ratio of 90 lb; initial cost is raised 16%. Doxford are developing 13,000 bhp engine, notes on which are given. Diesel machinery can now enter power range previously restricted to turbines and suitable for 32,000 to 38,000-ton tankers; such engines can operate on boiler fuel (3000 sec Red. I/100° F.) V. B.

1074. A series of four 4500 S.H.P. Gas turbines. Anon. *Mot. Ship*, 1953, **33** (395), 468.—Metropolitan-Vickers G-2 Naval gas turbine is a development of the Gatric unit; it is, as formerly, of the open cycle type, but improvements have been made in fuel consumption and output. Four of these units have been ordered by the Admiralty for use in torpedo boats—each boat to have two turbines for use at high speeds, and two diesel engines for manœuvring. Details are given of the G-2 unit, including power–wt ratio, combustion chamber, starting arrangements, etc. U. M.

1075. A small French jet engine. Anon. *Aeroplane*, 27.2.53, **84** (2171), 258.—A detailed description is given of the Turboméca Marboré 2, which produces a thrust of 880 lb. The layout consists of a single-sided centrifugal compressor and an annular combustion chamber leading to a single-stage axial turbine. The engine is considered suitable for use as a thrust booster for heavy aircraft, as the power plant for service training aircraft, target aircraft, guided missiles, and possibly for private, light aircraft. The fuel used is aviation kerosine to D.Eng.R.D.2482 or American JP-4 fuel specification, but since other similar engines in the Turboméca range can run on 100 to 130 octane gasoline or diesel oil it might be expected that the Marboré could do so also. The fuel system consists of a gear-type pump which pressurizes the fuel to about 115 psi. This is sufficient to pass it through the various control units before passing through the centre shaft of the impeller and so to the injector disc. The high speed rotation of the disc raises the pressure of the fuel to approx 2500 psi. U. M.

1076. Larger Thomassen gas engine–compressor unit. Anon. *Gas Oil Pwr*, 1952, **47**, 323–5.—These combined Vee engines and compressors are intended for oilfield and refinery use, and are constructed in sets of four, six, eight, and ten engine cyl. Each pair of cyl has an associated compressor cyl all connected by the same crank pin. The dimensions of the engine cyl are 420 mm bore by 500 mm stroke, and each pair develops 100 bhp at 300 rpm.

The cyl are provided with overhead valves and wet liners. The exhaust valve is water cooled and mechanically lubricated with gas oil/lub oil at 1 : 1 ratio. The cast iron pistons are oil cooled. Lub oil is circulated by a gear type pump.

The gas, supplied at ½ in w.g., passes through individual gas mixing valves fitted to each cyl.

The compressor cyl are double-acting machines, and the running gear is force-lubricated from the main oil system. A special oil supply is used for the cylinders and glands.

The engine can also be supplied without the compressor, and its output is then rated at 150 bhp per unit pair, at 428 rpm. H. C. E.

1077. Hunslet diesel Locomotive for Peru. Anon. *Gas Oil Pwr*, 1953, **48**, 12.—This six wheel 52-ton locomotive is powered by a Paxman Vee engine which develops 500 bhp at 1375 rpm. The max tractive effort is 35,000 lb, and the max speed is 35 mph. H. C. E.

1078. Metropolitan Vickers G2 naval gas turbine. Anon. *Gas Oil Pwr*, 1953, **48**, 15–18, 20.—This set comprises a gas generator, a power turbine with exhaust duct, and a reduction gear.

The gas generator has an eleven-stage axial-flow compressor. The finely atomized fuel is injected upstream through twenty orifices into the annular combustion chamber. The power turbine, mechanically independent of the gas generator, has a max designed speed of 5200 rpm. The unit is encased in Al sheets, and the ejector effect of the turbine exhaust draws air behind this casing to provide cooling.

A compressed-air motor starts the unit, and at 2000 rpm the ignition is switched on. Up to 3000 rpm, the idling speed, fuel is fed to the combustion chamber by boost pumps. At 3000 rpm the fuel supply is regulated by a main control valve consisting of a servo-operated calibrated needle moving in an orifice, and this controls the power output of the unit. Pool gas oil is used at a pressure of 600 psi in the combustion chamber at the rate of 630 g.p.h.

Lubrication of the generator and power turbine ball and roller bearings is by oil mist formed by spraying lub oil into the bearing with some of the compressed air from the compressor. This oil is not recovered. Lubrication of the main gears, etc., is by a pump working in a closed circuit.

The elec system is also described. H. C. E.

1079. Worthington two-stroke gas engine-compressor sets. Anon. *Gas Oil Pwr*, 1953, **48**, 13.—These sets, designed for service on oil pipelines, etc., comprise a power unit with vertical in-line cyl and a compressor unit of the horizontal crosshead type. The engine may have from five to ten cyl, each of 16 inches bore and stroke, and develops 200 bhp/cyl.

The cast iron pistons are so designed that equal heat flow has been achieved, and are cooled by oil which is forced through an annular space between the piston pin carrier and the skirt into a series of grooves on the underside of the piston crown. Thence, it is ejected as a fine spray to the inner wall behind the piston rings.

A low tension ignition system is employed for burning the gas, which is supplied at 40 to 60 psi, and the actual pressure is controlled by a throttle valve according to the load on the engine. Automatic devices guard against overspeed, oil failure, and high water jacket temp. Pressure lubrication is supplied to all main, connecting rod, camshaft, and gudgeon pin bearings, and valve gear by a gear pump driven from the crankshaft. Lubrication for the engine and compressor cyl is by force feed mechanical lubricator. H. C. E.

1080. Latest additions to the Perkins engine range. Anon. *Gas Oil Pwr*, 1953, **48**, 5.—The P3V type is a three-cyl vertical engine with cyl of bore 3½ inches and stroke 5 inches, giving a swept volume of 2·36 litres. It develops 32 bhp at 2000 rpm, and is intended for use in a commercial motor van.

The P4V engine is a four-cyl horizontal engine with cyl of the same dimensions as the P3V. It develops 52 bhp at 2400 rpm, and has a swept volume of 3·14 litres.

The L4 four-cyl vertical engine is a four-stroke unit with cyl of 4¼ inches and 4¾ inches bore and stroke respectively, giving a swept volume of 4·42 litres. It develops 62 bhp at 2000 rpm. Details of the construction of the latter engine are given. The Al-alloy pistons are fitted with three compression and two scraper rings. The combustion chamber is of the patented Aeroflow type, and a special injector is used. The engine is water cooled. H. C. E.

1081. Piston rings and pistons. G. Fox. *Gas Oil Pwr*, 1953, **48**, 21–4.—Experiments with square and tapered piston rings are described. The max temp which the top ring can withstand without the onset of ring sticking limits the power that can be developed by a diesel engine. The advantages and disadvantages of many designs of pistons, of which fourteen are illustrated, are given.

Oil cooling of pistons is shortly discussed, and the viewpoint taken that it is a necessary evil. Furthermore, in certain cases the provision of oil cooling may involve risk of cracking the piston heads. H. C. E.

1082. Some general considerations in the design of axial-flow gas turbines. S. Alpert. *S.A.E. Quart. Trans.*, 1952, **6** (4), 606–16.—Fundamental aerodynamic considerations involved in the design of the turbine component of the gas turbine engine are discussed,

which, confined to general techniques of direct relevance, constitute a practical outline on a basic level. Fixed design conditions concerning temp and pressure are discussed, followed by a consideration of the determination of velocity diagrams and of the design of blade profiles to yield these velocity diagrams. The four commonly accepted profile design methods are evaluated, and the importance of aerodynamics, stress, mechanics, fabrication, and assembly in the development of turbine design are emphasized.
J. G. H.

1083. High torque multiplication converters. A. H. Deimel. *S.A.E. Quart. Trans.*, 1952, **6** (1), 132–3, 137.—The conditions necessary for the most effective performance of the hydraulic torque converter are briefly noted, and the decisions which must be made prior to actual design are discussed, with particular reference to city-bus service. The advantages as compared with conventional gear changing systems are enumerated.
J. G. H.

1084. Power hydraulic system on a modern city transit bus. R. H. Fritzges. *S.A.E. Quart. Trans.*, 1952, **6** (4), 581–93.—All-hydraulic buses with power operated devices and auxiliaries are operating in American cities, and are stated to be evoking favourable comment from driving, passenger, and maintenance angles. The special design features of buses so equipped are described, together with their complete hydraulic equipment and its method of operation. It is suggested that savings in maintenance costs will be the ultimate factor in promoting the extended use of all-hydraulic buses. Possibilities and difficulties likely to be encountered in the application of the equipment to trucks are also discussed.
J. G. H.

1085. Combustion-chamber deposition and power loss. H. J. Gibson, C. A. Hall, and A. E. Huffman. *S.A.E. Quart. Trans.*, 1952, **6** (4), 594–605.—Power-loss by combustion chamber deposits is caused by thermal and physical restriction of the intake charge and the reduction of thermal efficiency. The effects of fuel comp, sulphur and lead concentration, lubricant comp, engine design, and operating conditions on deposit power loss are discussed, and the influence of engine operating conditions existent during the accumulation of deposits, together with the significance of the engine conditions selected to evaluate the extent of the deposit power loss, are illustrated. It is indicated that while differences in effect among the majority of commercial fuels and lubricants are small, the engine operating conditions under which the deposits are accumulated are a major factor, with const speed, const load operation representing the most adverse condition. Engine design is indicated as the principal means of alleviation, and modifications in combustion chamber and intake valve design to this end are suggested.
J. G. H.

1086. Analysing ignition problems of piston and jet engines. T. M. New. *Automot. Industr., N.Y.*, 1.9.52, **107** (5), 46–9, 84, 88, 90.—Report of a conference on aircraft ignition analysation problems in respect to using oscilloscope type analysers, sponsored by Scintilla Magneto Div. of Bendix Aviation Corpn. Subjects discussed include improvements in jet ignition systems, analysation of the creepage-gap ignition system, and use of ignition analysers in ignition overhaul shops.
J. G. H.

1087. Great fuel savings possible with ideal engine transmission. D. F. Caris and R. A. Richardson. *Automot. Industr., N.Y.*, 1.8.52, **107** (3), 42–6, 76–8.—Recent gains in engine efficiency, largely paralleled by corresponding developments in transmission, indicate the possibility of still further advances by the careful co-ordination of engine and transmission. Investigations by Research Div. of General Motors, utilizing the GM research engine and a standard production engine, with present and ideal transmission systems, are reported. Conditions discussed comprise min engine speed, typical point of min fuel consumption, typical performance calculation, and engine limited to speed of max hp. From data so obtained, it is suggested that an overall saving of 25 to 35% in fuel consumption may be eventually attained by engine transmission developments, in addition to simplification of ignition and carburetion equipment.
J. G. H.

1088. New tractor engine convertible for different fuels. W. F. Bradley. *Automot. Industr., N.Y.*, 1.8.52, **107** (3), 54–5.—Details are presented of the new Fordson Major tractor engine which can be converted for operation on Diesel fuel, vapourizing oil or gasoline. Four-cylinder block common to all three types has detachable wet liners, a five-bearing crankshaft, and valves in head with push rod and rocker operation. Diesel and V.O. models have bore of 3·97 inches and stroke of 4·56 inches; gasoline model has same stroke but bore of 3·77 inches. Horsepower at 1600 rpm is 35·8 for Diesel, 34·9 for gasoline, and 34 for V.O. Interchangeability of parts is common between gasoline and V.O. models. C.R. for latter is 4·35 to 1 by means of special head, and for former is 5·5 to 1; V.O. model is also fitted with special intake manifolding.
J. G. H.

1089. Polyphase torque converter. O. K. Kelley. *S.A.E. Quart. Trans.*, 1952, **6** (1), 138–42.—Torque converters using the liq at present available are subject to flow losses and shock losses. The causes of the various types of flow and shock loss are discussed, together with the means adopted for their reduction or elimination and the embodiment of these remedial measures in the polyphase converter. J. G. H.

1090. Transition from torque converter to fluid coupling operation in torque converters. P. R. Youngs. *S.A.E. Quart. Trans.*, 1952, **6** (1), 134–7.—The differences between the fluid coupling and torque converter are explained and illustrated, and the conditions under which each can be used to advantage are discussed, and methods and advantages of combining the two are indicated. J. G. H.

1091. Automatic and hydraulic transmissions. O. K. Kelley. *S.A.E. Quart. Trans.*, 1952, **6** (2), 347–56.—The application of automatic transmission to passenger cars, buses, cross-country military vehicles, off-the-highway equipment, and trucks is discussed, and special requirements in each of these categories are indicated. The present trend towards the use of Hydra-matic and hydrodynamic principles in the development of variable drive ratios is remarked, and these systems are considered in detail.
J. G. H.

1092. Hydra-matic transmission. W. B. Herndon. *S.A.E. Quart. Trans.*, 1952, **6** (1), 128–31.—The history of the hydra-matic transmission is briefly reviewed. The fundamental design and main components of the transmission are indicated, and details of the new variable-capacity vane type of pump,to be shortly introduced, are presented.
J. G. H.

1093. Positive direct-drive two-stage torque converters. F. R. McFarland. *S.A.E. Quart. Trans.*, 1952, **6** (1), 143–6.—The four most common arrangements with which the torque converter can be used in passenger cars are summarized, and the special characteristics to be developed for each of these arrangements are indicated. The positive direct-drive two-stage converter, as selected by Packard, is discussed in more detail, and the steps leading up to its present stage of development are described.
J. G. H.

1094. Two stage torque converter and double clutch. R. M. Schaifer. *S.A.E. Quart. Trans.*, 1952, **6** (1), 147–9.—The development of the two-stage torque converter with automatic double clutch is described, with particular emphasis on the tendency to substitute casting for fabrication in a number of transmission units. J. G. H.

1095. New horizons in engine development. J. C. Zeder. *S.A.E. Quart. Trans.*, 1952, **6** (4), 677–88, 723.—The historical background of the development of the spherical segment combustion chamber is briefly reviewed, and a series of tests using regularly available and special fuels with experimental engines showed power outputs far greater than with previous designs. It is shown that a hemispherical head design resulted in a thermal efficiency equal to one fuel C.R. better than the next best design, that of the conventional overhead valve.

A new engine based on this design develops more than 180 hp in the production version, using only non-premium fuels, and is expected to meet any demands which may be made upon it when the anticipated quality fuels of the future become available.
J. G. H.

1096. Economic relationship of engine-fuel research. C. L. McCuen. *S.A.E. Quart. Trans.*, 1952, **6** (2), 290–303.—The history of automobile development from the beginnings to 1930 is briefly reviewed, and a series of graphs are presented, indicating automobile trends from 1930 to 1950. Trends discussed include O.N.s, fuel economy, compression ratio, part throttle octane utilization, and effect of automatic transmissions on octane requirements. It is suggested that increased compression ratio presents the most fruitful field for future engine development, resulting also in marked fuel economy. J. G. H.

1097. Patents. U.S.P. 2,605,610 (France 3.9.46; 5.8.52). L. A. Hermitte and M. H. L. Sedille, assrs to Société Rateau and R. Anxionnaz jointly. Mutiple gas turbine power plant supplying waste heat to an air preheater and a boiler in parallel.

U.S.P. 2,605,706 (15.10.49; 5.8.52). S. Lemanski. Fuel injection device.

U.S.P. 2,605,709 (U.K. 18.8.49; 5.8.52). A. Jubb, assr to Rolls-Royce Ltd. Fuel metering device for gas turbine engines.

U.S.P. 2,606,537 (8.7.50; 12.8.52). W. M. Baumheckel. Supplemental selective feeding of water and alcohol in an engine fuel feed device.

U.S.P. 2,606,538 (3.12.46; 12.8.52). J. B. Malin, assr to The Texas Co. Fuel injection for spark ignited I.C. engines.

U.S.P. 2,606,543 (20.4.48; 12.8.52). A. Rappl, assr to Trico Products Corpn. Fuel feeding system.

U.S.P. 2,606,545 (Germany 3.8.50, 12.8.52). E. Sommer, assr to Daimler-Benz A.G. Control device for solid-injection I.C. engines.

U.S.P. 2,607,190 (Netherlands 27.7.48; 19.8.52). J. W. L. Kohler, assr to Hartford National Bank & Trust Co. Closed cycle hot-gas reciprocating engine with means for augmenting the working medium.

U.S.P. 2,607,332 (13.11.48; 19.8.52). A. S. Bosma, assr to Hart-Carter Co. Oil reservoir for outboard motors.

U.S.P. 2,608,093 (4.6.48; 26.8.52). A. E. Traver, assr to Socony-Vacuum Oil Co. Apparatus for simultaneously and separately portraying on the screen of a cathode-ray oscilloscope a number of conditions existing in an operating I.C. engine.

U.S.P. 2,608,187 (U.K. 20.11.46; 26.8.52). F. M. Stewart. Upper cyl lubricator for I.C. engines.

U.S.P. 2,608,708 (Sweden 18.9.47; 26.8.52). H. G. Camner, assr to A. B. Atlas Diesel. Pressure reduction valve for fuel injection devices permitting flow of fuel in two directions.

U.S.P. 2,608,247 (U.K. 20.1.47; 26.8.52). F. H. Carey, assr to Dowty Equipment Ltd. Fuel supply system for spill type burners for aircraft engines. J. M. S.

Safety Precautions

1098. Safety saves money. K. H. Welsh. *World Oil*, 1.2.53, **136** (2), 140.—The factors involved in the maintenance of safety in any industry are inter-related. They may be subdivided into humanitarian, economical, and insurance aspects. Frequently, an accident results in more than personal injury; frequently, it is followed by a train of accidents to equipment. The occurrence of accidents also has a bad effect on personnel. Two diagrams show the events following accidents—or their prevention. In conclusion, accident prevention, in the broader sense, for the driller, results in more ft of good hole made at a min cost. A. J. H.

1099. Production of electrostatic charges in the handling of anhydrous inflammable solvents. M. Lecoustey. *Chim. et Industr.*, 1953, **69**, 142–6.—Fundamentals of static electricity and of the principles of a condenser are summarized. Mechanism of charge

production in liq is illustrated with aid of diagrams, and importance of the adequate earthing of the operator, as well as the receiver, is stressed. Hazards that can occur in dry-cleaning plants are described, with suggestions for their avoidance. V. B.

1100. Patent. U.S.P. 2,606,619 (7.11.49; 12.8.52). C. L. Whigham. Oil well safety device. J. M. S.

MISCELLANEOUS

1101. The emulsion method of extinguishing oil fires by water. A. E. Lambert. *Inst. Fire Engrs Quarterly*, Jan.–March, 1953, **13**, 28–34.—The burning of combustible solids and oils, and the effect of high pressure water spray on these burning materials, are briefly outlined. The principles of emulsification are described. In extinguishing oil fires, by the emulsion-forming method, a special type of nozzle, called a projector, is used. This discharges a cone of water, in the form of evenly distributed broken steams travelling at high velocity and with high momentum, which bombards the oil surface and, on impact, the kinetic energy released causes the oil to break into minute globules which are surrounded by a water film, the water film protecting the oil from the heat. The emulsion spray cannot conduct electricity. Nozzle pressures of 40 psi for indoor installations and 50 psi for outdoor work are necessary. Various types of projectors are described which ensure emulsification at ranges of 1 to 50 ft from the oil surface. The scope of emulsifying water spray system is described. Automatic control is extensively discussed, and manual control, water supplies, and alarms are described. W. H. C.

1102. Optics in the oil industry. P. D. Foote. *J. opt. Soc. Amer.*, Dec. 1952, **42**, 886–97.—The contributions of optical science to the pet industry are reviewed. Developments in, and use of, emission, infra-red, ultra-violet, and Raman spectroscopy are discussed. and the extent and importance of thermodynamic data obtained from such investigations are described. Hydrocarbon stability, photochemistry, optical activity, and other optical properties, the use of X-ray, and electron diffraction techniques, the electron microscope, and mass spectrometer are discussed. The numerous optical apparatus and instruments used in geological prospecting and aerial mapping are extensively discussed. W. H. C.

1103. An engineer's view of the dollar. S. Steele. *Chem. Engng*, 1953, **60** (2), 157–61.—Consideration of cost estimation with inflation. D. M.

1104. Computing gas volumes from orifice-meter charts integrator data. A. C. Buchanan and H. Skinner. *Oil Gas J.*, 2.2.53, **51** (39) 72.—The punched card system in use at Magnolia Petroleum Co, Dallas, is described for general accounting, including accident and fire prevention statistics, tank-car movements, and pet research. G. A. C.

1105. A special study of ash and clinker in industry. Summary of proceedings of the London Conference. Anon. *J. Inst. Fuel*, 1953, **25** (147), 338.—The conference was held on 28/29 October 1952. A summary is given of the speech of the President, Dr G. E. Foxwell, and of the main conclusions as given by D. T. A. Townsend, official rapporteur. The rapporteur's summary considers the papers and discussions under the following sub-headings: ash and its characteristics; coal preparation; ash in relation to boiler efficiency; clinker formation and slag attack; fly-ash and deposits; utilization of high-ash coals; the steel industry; and gas producers. D. K.

1106. Know your oil words. Anon. *Petrol. Process.*, 1953, **8**, 1, 70–1.—An up-to-date list of glossaries of pet terms has been compiled by the Petroleum Sect. of the Special Libraries Assn. in the U.S. The list includes ninety-two titles of specific articles, periodicals, dictionaries, and glossaries on the meaning of the pet industry's terminology. J. W. H.

BOOK REVIEWS

Considérations techniques générales sur les dérivés des pétroles. Combustibles liquides et lubrifiants. E. Fouret and M. Blanchier. Paris: Blondel la Rougery, 1952. Pp. vi + 269. 25 × 16 cm.

This book, which is confined to a discussion of fuels (including automotive) and lubricating oils, has been written for technologists in other industries, who require instruction in petroleum matters.

The book is divided into four main parts. The first of these deals with the chemistry of petroleum, its origin, and the nomenclature of the products. A section is devoted to a rapid review of the main physical and chemical refining processes employed in the petroleum industry in the production of engine fuels.

The second part is concerned with fuels (gasoline, diesel fuel, jet fuel, fuel oil), and deals with the properties of these materials and the significance of such properties from the point of view of application. Topics which are, for a book of this type, quite adequately treated include combustion characteristics of engine fuels, and the stability and flow properties of fuel oils. Some paragraphs of this part (*e.g.*, those dealing with vapour pressure and gum) overlap to a certain extent with paragraphs dealing with the same topics in the last part of the book.

The third, and largest, part is concerned with lubricants. The refining of these is but very briefly sketched, but the properties required in lubricating oils, and especially the fundamental significance of such properties, is well covered. The various groups of additives are discussed, and typical examples of each are given, including, which is informative, the chemical composition of many of the more usual commercial additives. There are several pages devoted to synthetic lubricants, both the hydrocarbon and non-hydrocarbon types being included, although there is no mention of the fluorocarbons.

It is a little surprising that when discussing the classification of lubricating oils, particularly those for I.C. engines, the S.A.E. classification is not quoted (although S.A.E. numbers are mentioned elsewhere in the text), especially as, when dealing with greases, which are considered in somewhat greater detail, the classification based on ASTM penetration is given; in this section there is rather more information concerning manufacturing methods.

The last part of the book is a general review of petroleum test methods, with special reference to the conclusions to be drawn from the results obtained. Quite rightly, in the reviewer's opinion, space is not wasted in giving the details of the methods discussed. These are only very briefly mentioned (in fact, some slightly greater detail, for the benefit of those not familiar with the procedures concerned, would have made the subsequent discussion clearer), but the treatment is centred on the interpretation of the information such tests may yield. A warning is given against a rigid adherence to standard test methods without a fundamental understanding of their possible limitations, since such methods cannot be always applicable in certain cases of contaminated or otherwise anomalous materials.

The increased difficulties of analysis due to the presence of additives in oils are clearly explained, and suggestions are made for overcoming these to a certain extent at least (*e.g.*, removal of the additive by clay treatment).

The author's somewhat critical attitude towards diesel index and similar non-engine methods of assessing quality of diesel fuels is perhaps a little harsh. Also, the Ramsbottom carbon residue method is dismissed rather summarily in favour of the more cumbersome Conradson.

In the paragraph devoted to the taste of oils, it is interesting to note that absence of taste is the criterion employed by the French Customs for classifying an oil as a white oil. The comments of French oil-testing laboratories on this requirement might make interesting reading.

Somewhat surprisingly, no direct mention or consideration is given in the discussion of tests and their significance to flash point, a test which one would have thought important from the commercial (*i.e.*, storage and transportation) aspects, if not on technical grounds.

On the whole, the book can be heartily recommended as fulfilling the purpose

stated in the preface. It does give an excellent, rapid, summary of the main features in the field covered, to scientifically trained personnel who are unacquainted with petroleum technology. Detail is, of course, lacking, but, in the consideration of the various processes and tests which are mentioned, due regard is paid to the fundamental principles on which such are based. Misprints and the like are few: on p. 231, 28° is given, instead of 38°, as the temperature of the Reid test; on p. 253, the acrylic ester type of pour depressant is stated to be entirely a hydrocarbon, although the constitution of this material was previously correctly given on p. 159; Stokes is consistently misspelt as Stockes. The book being intended only as an outline, the authors have, quite understandably, stated that they have omitted references to original publications; the omission of an index is, however, difficult to justify. Binding and printing are good and much better than in many French publications of previous years. V. B.

Illustrated Petroleum Dictionary and Products Manual. Los Angeles, U.S.A. Petroleum Educational Institute, 1952. Pp. 502. $8.00.

As its title indicates, this is more than a dictionary, as it provides general information on petroleum products and processes, as well as definitions of terms used in the petroleum industry. Considerable thought has obviously been given to the preparation of definitions, for the understanding of which a high technical standard is not required. Much use is made of drawings, some of which are quite amusing and helpful both in explaining and in familiarizing beginners with the appearance of equipment, etc.

Errors and important omissions do not appear to be serious, but in any future editions some improvement should be made to the note on Petroleum (composition) which suggests that ethane possesses two, four, or six hydrogen atoms. It would be pleasant also to see "kerosene" spelt with an "i" in accordance with agreed British and American practice, and its boiling range (150° to 300°) should be corrected from ° F to ° C.

In general, this book can be recommended for inclusion in libraries, as well as for office use, as a general reference book, particularly for non-technical or the younger members of the staff.

It must, however, be recorded that it is not well printed, the ink varying from deep black and smudgy to almost a light grey. For the price of $8.00, the conventional letterpress printing process would be expected instead of the photo-lithographic process used. A little more care in the binding might also have avoided the omission of pages 423 and 424, and their replacement by a repetition of pages 435 and 436, as has happened to the reviewer's copy. C. L. G.

ASTM Standards on Petroleum Products and Lubricants (with related information). 1952 edition. Philadelphia, Pa.: ASTM, 1952. Pp. 810 + xxi. $6.40. (Copies available from Institute of Petroleum, £2 2*s*.)

Prepared by ASTM Committee D-2 on Petroleum Products and Lubricants, this edition gives in their latest form 135 ASTM standards, including 119 test methods; ten specifications; one classification; three lists of definitions relating respectively to petroleum, specific gravity, and rheological properties of matter; two recommended practices: one for the purchase of uninhibited mineral oil for use in transformers and in oil circuit breakers, and one for designating significant places in specified limiting values; and other material. Included also are standard specifications for ASTM thermometers, and test method standardization of etched-stem liquid-in-glass thermometers.

New material includes tentative specifications and test methods for: vacuum distillation of liquid and semi-solid asphaltic materials to obtain a residue of specified penetration; reagent water; farm tractor fuels; analysis of calcium and barium petroleum sulphonates; measurement of density and specific gravity of liquids by Bingham pycnometer; measurement of refractive index and refractive dispersion of hydrocarbon liquids; mercaptan sulphur in jet fuels (colour-indicator method); calibrating upright tanks; asphalt-base emulsions for use as protective coatings for built-up roofs; and ASTM–IP petroleum measurement tables.

Appendices include proposed methods of test for: API gravity by hydrometer;

specific gravity by hydrometer; hydrocarbon types in jet fuels; water in petroleum and bituminous products; polarographic determination of tetraethyl lead in gasoline; tensile strength of paraffin wax; manometric method with null head pressure transmitter for vapour pressure; oil content of petroleum waxes; flash point of volatile solvents by the tag open-cup apparatus; and proposed specifications for ASTM hydrometers.

ADDITIONS TO THE LIBRARY

The Junior Institution of Engineers. Journal and Record of Transactions. Vol. LXII, 1951–2. London: The Institution, 1952. Pp. 452 + viii.

A Handbook of Colorimetric Chemical Analytical Methods. Salisbury: The Tintometer Ltd., 1953. Pp. 120. 15*s.* 0*d.*

Detailed technical instructions are given for laboratory use of the Lovibond Comparator. In four parts, the first is a general description of the apparatus, the second deals with pH values, and the third details thirty methods of chemical analysis, and the last over twenty clinical methods. Provision is made for insertion of additional pages as published.

Improvement of Nickel Cracking Catalysts. C. H. Riez, H. A. Dirksen, and W. J. Plecticka. Institute of Gas Technology Research Bull. 20. Chicago, Ill.: The Institute, 1952. Pp. 28 + iv. $3.50.

Describes research to improve the performance of nickel on aluminium sphere catalysts used in processing material gas and condensates. It is shown that periclase and alumina are effective supports for nickel dispersions, that small amounts of magnesia or alumina enhance catalyst activity, that on periclase supports of varying porosities the activity depends on quantity of nickel deposited per unit of catalyst volume.

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Oilfield Exploration and Exploitation

Geology

1107. Louisiana–Arkansas region may yield additional oil. T. H. Philpott. *World Oil*, Nov. 1952, **135** (6), 108.—The regional geology and stratigraphy of the Cretaceous of North Louisiana and South Arkansas, which has produced approx 1½ billion brl of oil, are described, and the significance of regional structural elements such as the Ouachita Mountains, Monroe Uplift, Sabine Uplift, Desha Basin, and the Interior Sale Dome Basin is discussed.

Isopach maps of the Upper (Gulf) and Lower Cretaceous (Comanche) tend to show depo-centres as well as margins of the basins, whilst the Pre-Gulf Cretaceous erosion is illustrated by a map showing the areal distribution of the formations below the unconformity.

A north–south stratigraphical section over the Monroe Uplift is included to emphasize pertinent relationships and the importance of the unconformities at the base of the Gulf and the Comanche. W. S. R.

1108. Greenough Pool. J. R. Kyle. *Petrol. Engr*, Nov. 1952, **24** (12).—The discovery well drilled in Feb. 1952 to a depth of 5867 ft produced at an initial rate of 936 b.d. 41° API oil and 1845 m.c.f. gas per day, from a 19-ft Pennsylvanian Lower Oswego lime.

Development wells are drilled on a 40-acre pattern. At the end of Sept. there were 3 producing wells, 1 drilling well, and 1 dry hole, the latter unsuccessfully testing the Mississippian.

Typical electrical logs are included. W. S. R.

1109. Oil in Algeria. J. B. Eby. *World Oil*, Nov. 1952, **135** (6), 317.—The single producing field in Algeria is at Oued Gueterini, about 70 miles S.E. of Algiers. The field, discovered in 1949, produces 1400 brl 38·9° API oil per day from 57 wells.

Production comes from coarse-grained phosphatic limestone lenses in the Lower Eocene at depths of 1920 and 3070 ft, the subsurface being complicated by numerous laminated thrust sheets of Miocene beds over and on Cretaceous rocks.

Further exploration in other concessions is being carried out by the use of aerial photographs and geophysical surveys. W. S. R.

Geophysics and Geochemical Prospecting

1110. Geophysical prospecting. D. T. Germain-Jones. *Nature, Lond.*, 1953, **171**, 202.—A summary of papers presented to a meeting of the European Assoc of Exploration Geophysicists at Hanover, Dec. 1952. H. C. E.

1111. Patents. U.S.P. 2,614,165 (23.2.49; 14.10.52). W. W. Doolittle, assr to Stanolind Oil and Gas Co. A detector spread for marine seismic surveying, comprising

a tension and conductor cable having a plurality of buoyant supporting means arranged at intervals along the cable, and alternating with a plurality of detectors which are normally submerged.

U.S.P. 2,614,166 (24.4.50; 14.10.52). R. G. Piety, assr to Phillips Petroleum Co. Apparatus for determining the direction of arrival of waves in a preselected reference plane, in which the modulated outputs from two wave detector units are combined to give a resultant voltage and the phase difference between this resultant voltage and a carrier voltage, related to the modulated outputs, is determined.

U.S.P. 2,614,804 (29.1.49; 21.10.52). C. H. Carlisle, assr to Standard Oil Development Co. Apparatus for placing an explosive charge in the earth beneath a body of water, comprising a hollow bit member with an explosive charge therein, a drill stem to advance the bit member into the earth and means, including a longitudinally sliding joint, to release the bit member from the drill stem.

U.S.P. 2,615,521 (25.5.48; 28.10.52). T. C. Poulter, assr to Institute of Inventive Research. Apparatus for seismic exploration which includes a plurality of substantially flat plates of explosive and a geophone.

U.S.P. 2,615,522 (2.7.49; 28.10.52). T. C. Poulter, assr to Institute of Inventive Research. Seismic exploration with elevated charges arranged to produce, on firing, a gas pressure on the earth's surface of a duration which is one-quarter of the period of seismic disturbance most readily transmitted by the earth in the region under study.

U.S.P. 2,615,523 (2.7.49; 28.10.52). T. C. Poulter, assr to Institute of Inventive Research. A method of seismic exploration which includes applying to the earth, over a wide area, two successive impulses spaced from one another by an interval substantially equal to three-fourths of the natural period of earth vibration in the region under study.

U.S.P. 2,615,524 (2.7.49; 28.10.52). T. C. Poulter, assr to Institute of Inventive Research. A method of seismic exploration employing elevated charges which produce a first direct shock wave and a second interference shock wave, spaced from the first by a time interval which is equal to the period of the vibration most readily transmitted over a desired seismic reflection path. D. A. R.

U.S.P. 2,617,945 (9.3.48; 11.11.52). A. H. Lord and E. Pancake, assrs to Texas Co. Prospecting, using γ-ray detection.

U.S.P. 2,618,999 (8.9.48; 25.11.52). D. H. Scott, assr to Texas Co. Device for setting an elongated explosive seismic charge in a water-covered area.

U.S.P. 2,619,186 (24.1.48; 25.11.52). C. R. Carlisle, assr to Standard Oil Development Co. In seismic prospecting using an underwater explosive charge, secondary seismic impulses are prevented by simultaneously exploding a plurality of charges in the same horizontal plane, at such a depth that the water is not blown out, the charges being so spaced that the envelopes of gas bubbles produced break into each other.

U.S.P. 2,619,520 (2.3.49; 25.11.52). C. R. Nichols. Method of electrical prospecting which consists in determining physical characteristics of a sub-surface area by measuring and integrating the p.d. between a base potential and the potential of a point in said area during an observation period in which appreciable changes in stray earth currents may occur. J. M. S.

Drilling

1112. Results of deep test drillings on the structure Dubranec (Yugoslavia). S. Galovic. *Nafta* (*Yugoslavia*), Nov. 1952, **11**, 360–2.—Geographical and geological relations of the structure Dubranec (Yugoslavia) are described. The structure is built up of Miocene and Pliocene formations, the strength of which is about 800 m, laying directly on basement.

The structure was first explored during 1935–40 by 3 deep test drillings. After the first negative result, geophysical prospecting indicated a closed structure in the north of one of the wildcats drilled. Later, in 1951, this finding was reaffirmed by geomagnetic measurements, and additional data were obtained on the depth of basement.

Two test drillings revealed that the oil-bearing Miocene and Pliocene horizons of this structure are without sand strata, which could explain the negative results obtained by drilling. (Author's abstract.)

1113. Patents. U.S.P. 2,613,059 (5.6.46; 7.10.52). A. R. Maier and J. W. Jacoby, assrs to United States Steel Co. Well drilling rig.

U.S.P. 2,613,060 (13.2.50; 7.10.52). C. R. Trahan. Rotary table drive construction.

U.S.P. 2,615,585 (27.2.47; 28.10.52). J. W. Menkall. Well derrick, rig, and pipe racking apparatus. D. A. R.

U.S.P. 2,616,749 (6.1.47; 4.11.52). R. G. Alford, assr to Houston Oil Field Material Co. A washover overshot to be lowered into a well and manipulated therein to grip a member.

U.S.P. 2,617,485 (11.3.47; 11.11.52). J. W. Thatch, assr to Regan Forge and Engineering Co. Casing head.

U.S.P. 2,617,486 (9.8.49; 11.11.52). J. J. Davis. Well fishing tool.

U.S.P. 2,617,500 (16.7.48; 11.11.52). H. W. Cardwell and G. G. Brown, assrs to Cardwell Manufacturing Co. Portable drilling rig.

U.S.P. 2,617,767 (21.10.50; 11.11.52). P. W. Fischer, assr to Union Oil Co. of California. An oil-base drilling fluid comprising a mineral oil having dispersed therein 1 to 10 wt % of a metal soap, 0·1 to 5 wt % of a hydratable clay, 0·2 to 10 wt % of water, and 2 to 20 wt % of finely-divided pine wood resin.

U.S.P. 2,617,852 (10.2.50; 11.11.52). H. C. Waters, assr to Perforating Guns Atlas Corpn. Electrical well logging system.

U.S.P. 2,618,466–7 (16.4.48; 1.9.50; 18.11.52). E. W. Bagnell and W. F. Bettis, assrs to Johnston Testers Inc. Rotary well jars.

U.S.P. 2,618,595 (5.4.49; 18.11.52). E. W. Gloor, assr to Hercules Powder Co. An aq well drilling mud, containing a small quantity of a water-sol carboxymethyl hydroxyethyl cellulose.

U.S.P. 2,618,596 (7.6.50; 18.11.52). A. Minich and M. Nowak, assrs to Nuodex Products Co. Fluid suitable for fracturing subterranean stone formations comprising a hydrocarbon oil and a hydroxy aluminium soap of a mixture of tall oil and coconut acid.

U.S.P. 2,619,181 (11.7.49; 25.11.52). P. J. Lea and H. B. Fisher, assrs to Phillips Petroleum Co. Hydraulic cement slurry for cementing oil wells contains 0·1 to 3 wt % of inulin based on the dry cement.

U.S.P. 2,619,323 (7.1.50; 25.11.52). J. G. Jackson, assr to Eastman Oil Well Survey Co. Method of protecting well casing from damage by slippage of strata.

U.S.P. 2,619,324 (2.2.48; 25.11.52). R. Bassinger. Percussion tool for oil wells.

U.S.P. 2,619,325 (2.1.52; 25.11.52). A. Aruntunoff. Core disintegrating drilling tool.

U.S.P. 2,619,393 (20.10.47; 25.11.52). R. A. Wilson and J. A. Wilson. Well swab. J. M. S.

Production

1114. Resistivity of a fluid-filled porous body. J. E. Owen. *J. Petrol. Tech.*, July 1952, **4** (7), AIMME Tech. Paper No. 3352, 169–74.—Explanations of high formation factors in terms of tortuosity of uniform pore paths ignore the variations in cross-sectional area of the conducting paths. In order to explore the latter factor, resistivity measurements have been made on cubes which could be used to build a synthetic porous mass. The cube had a central cubic void connected to the centre of each face by square-sectioned channels. The electrical resistance between opposite faces was measured when the cavities were filled with saline water. The constriction factor, defined as the ratio of the side of the cubic void to the side of the square channel, was plotted against the corresponding resistance ratio. The shunting effect of the 4 side

tubes diminishes rapidly as the constriction factor increases, and is negligible when this factor exceeds 3.

On the basis of the above model, a relationship for the formation factor is derived, and formation factors are calculated for synthetic porous bodies for 4 values of porosity and 3 values of tortuosity. For any chosen porosity and tortuosity, the formation factor is nearly independent of the constriction factor when the latter is less than two.

It is concluded that constriction can be combined with moderate amounts of tortuosity to give model pore systems showing, to a first approximation, porosity and resistivity properties similar to those of natural porous bodies. G. D. H.

1115. Strataflow process : a recent development in locating water entry in wells. R. E. Hartline and W. Tapper. *J. Petrol. Tech.*, July 1952, **4** (7), AIMME Tech. Paper No. 3351, 183–86.—The Strataflow process involves introducing into the well a fluid of markedly different salinity from that which is being produced. At present, the technique is applicable only to pumping wells, and during the test a 1-inch dia electrode is run in the annulus between the tubing and casing to locate the relevant resistivity changes. The conditioning fluid is run into the annulus and during the normal test the well is on production. At its point of entry, any formation water causes a change in the resistivity of the conditioning water.

The results of a Strataflow test are given together with test data which confirm the deductions made from the resistivity surveys. The survey can usually be done in about 8 to 10 hr working time. A pulling unit is not necessary at the well during the test. Tubing leaks must be repaired before the test. The pump inlet must be set as low as possible, since below this point only aggregate production of water can be detected. In addition to pumping runs, build-up runs may also be made, for when water injection and pumping are stopped, entry of any bottom water will cause the resistivity change to move upwards, the rate being a measure of the rate of bottom water production. G. D. H.

1116. Pressure control by water injection—a resumé of case histories. E. P. Burtchaell and E. R. Smith. *J. Petrol. Tech.*, July 1952, **4** (7), 15–18.—Data are given on the Porter, New Hope, West Hackberry, East Hackberry, Longville, Mamon, Haynesville, Magnolia, Midway, Wesson, and Schuler fields for horizons which have been subjected to water injection. At Porter, water injection caused three up-dip wells to return to low G.O.R. production. 23 pumping wells at New Hope (Bacon lime pool) returned to flowing on water injection. The flood has moved uniformly up-dip at East Hackberry. The reservoir pressure at Longville has risen 340 p.s.i. under water injection. At Haynesville, both gas and water injection have been carried out, but the former is to be discontinued. Acceleration of depletion was the reason for water injection at Magnolia, for this field has an active water drive. Formerly, the pressure decline at Midway was 20 to 30 p.s.i/month, but after eight years of water injection the pressure has been raised by 60 p.s.i. At Schuler, pressure has been maintained by water injection since 1941, and the cost is believed to be only half of the expenditure which would otherwise have been needed on pumps. Two-thirds of the Wesson wells have returned to flowing, and the pressure has increased nearly to the original value as a result of the axial water injection in the offshore bar. G. D. H.

1117. Possibility of cycling deep depleted oil reservoirs after compression to a single phase. D. L. Katz. *J. Petrol. Tech.*, July 1952, **4** (7), AIMME Tech. Paper No. 3350, 175–82.—It is proposed that serious consideration should be given to compressing gas into a partially depleted gas drive reservoir to bring the remaining oil into a single gaseous phase. The vaporized oil would then be recovered by cycling. An account is given of the principles and problems involved and the results of a theoretical investigation for a field.

The process seems feasible for reservoirs over 6000 ft deep, and might be applied to most crudes over 35° API by the use of natural gas enriched with L.P.G. Asphaltic constituents might not vaporize, but remain as a plastic solid. There may be difficulties in getting adequate contact between the gas and oil. The process may be the most economical secondary recovery method for some deep reservoirs. G. D. H.

1118. Patents. U.S.P. 2,613,916 (21.10.50; 14.10.52). J. N. Gregory, assr to Shell Development Co. Sampling sub with removable cutting collector.

U.S.P. 2,613,918 (20.2.50; 14.10.52). T. L. Long, assr to Johnston Testers Inc. Wire line core barrel.

U.S.P. 2,613,980 (13.3.50; 14.10.52). K. C. Hawkins. A fishing tool for retrieving magnetizable objects from well casings.

U.S.P. 2,614,635 (4.4.46; 21.10.52). P. S. Williams and H. J. Welge, assrs to Standard Oil Development Co. A method of improving oil production from a subterranean formation penetrated by a bore hole, which comprises forcing a liquid silicone polymer, preheated to a temp of at least 500° F, into the formation.

U.S.P. 2,614,648 (2.4.48; 21.10.52). S. A. Wilson, assr to Maloney Crawford Tank and Manufacturing Co. A method of separating oil and gas, and scrubbing the oil and gas streams, in which an influent mixture flows horizontally into a horizontal tank.
D. A. R.

U.S.P. 2,616,502 (15.3.48; 4.11.52). W. C. Lenz, assr to Texas Co. By-pass connexion for hydraulic well pumps.

U.S.P. 2,616,503 (30.9.48; 4.11.52). A. L. Armentrout. Circulation control for wells.

U.S.P. 2,617,296 (20.12.46; 11.11.52). J. D. Wisenbaker, assr to Core Laboratories Inc. Oil well core samples are preserved for future study by deep freezing promptly after extraction from the well.

U.S.P. 2,617,299 (27.12.46; 11.11.52). G. H. Ennis and W. W. Ennis. Apparatus for continuously measuring oil and water production of wells.

U.S.P. 2,617,941 (17.2.50; 11.11.52). D. E. Craggs, assr to Union Oil Co. of California. Measurement of fluid flow in well bores by means of a radioactive tracer.

U.S.P. 2,618,151 (7.10.48; 18.11.52). W. J. Leas, assr to Standard Oil Development Co. Cell for determining the relative permeability of a rock sample to a plurality of fluids.

U.S.P. 2,618,156 (31.12.49; 18.11.52). F. G. Boucher, assr to Standard Oil Development Co. Apparatus for determining gravity gradients in a borehole.

U.S.P. 2,618,339 (24.12.46; 18.11.52). R. C. Glover, assr to Baker Oil Tools Inc. Apparatus for mixing production from the upper and lower producing zones of an oil well.

U.S.P. 2,618,340 (23.5.47; 18.11.52). W. E. Lynd, assr to Lane-Wells Co. Method of detecting leakage past a well packer, which involves releasing a tracer material into contact with the well wall between the upper and lower ends of the packer, shutting in one of the producing zones, producing in the other zone, and testing the production for the tracer material.

U.S.P. 2,618,341 (23.5.47; 18.11.52). L. D. Meddick and J. T. Gardiner, assrs to Lane-Wells Co. Well packer.

U.S.P. 2,618,342 (3.9.46; 18.11.52). G. Meyer, assr to Lane-Wells Co. Control device for well tools.

U.S.P. 2,618,343 (20.9.48; 18.11.52). M. B. Conrad, assr to Baker Oil Tools Inc. Gas pressure operated well apparatus.

U.S.P. 2,618,344 (20.4.46; 18.11.52). G. F. Turechek and D. G. Moorhouse, assrs to Lane-Wells Co. Bridging plug.

U.S.P. 2,618,345 (British West Indies 23.12.47; 18.11.52). A. W. Tucker. Bridge plug and dump boiler.

U.S.P. 2,619,180 (15.5.48; 25.11.52). R. A. Smith and Le M. Pierce. Apparatus for cleaning well bores with pressurized liq.
J. M. S.

Oilfield Development

1119. Acidizing made the Ringwood Pool. H. E. Lillibridge. *Petrol. Engr*, Nov. 1952, **24** (12).—Initial wells drilled in the Ringwood pool, discovered in 1945, produced considerable gas but little oil. Of the 228 wells now drilled, very few could be com-

pleted without acidizing, and where completion was possible volume treatment increased the production.

The Manning, which is the producing horizon, is believed to be Chester in age, and is very variable in composition and porosity.

Salt contamination necessitates the use of a salt water mud.

A series of electric logs and a structural map of the field are included. W. S. R.

1120. Exploratory completions fall to five month low. C. W. Smith. *World Oil*, Nov. 1952, **135** (6), 119.—887 wells were completed in the U.S.A. in Sept. 1952, compared with 959 in the previous month. Cumulative total for the year was 8071, of which 18·2% were producers.

Tables show the results of exploratory drilling in the U.S.A., by districts, for Sept. and the first 9 months of 1952. W. S. R.

1121. Exploratory drilling hits all-time high. Anon. *World Oil*, Dec. 1952, **135** (7), 122.—A record of 1068 exploratory wells were completed in the U.S.A. in Oct. 1952, compared with 880 in Sept. and 978 in July 1952, the previous record month. 169 or 15·8% of the total were producers and 102 new pools were discovered.

Results are tabulated by districts. W. S. R.

1122. Canada in 1952. G. M. Wilson. *World Oil*, Dec. 1952, **135** (7), 283.—Prior to the discovery of the Leduc field, Western Canada produced only 19,000 b.d., compared with a present production of 275,000 b.d. and an estimated production of 420,000 b.d. in 1954. Similarly, oil reserves have risen from 45 million brl to approx 1·75 billion brl, whilst gas reserves previously 15 billion are now estimated to be 9000 billion cu. ft.

From Jan. to Sept. 1952, 133 oil or gas strikes were made in Western Canada, 100 being in Alberta, 22 in Saskatchewan, and 9 in British Columbia. The most important discoveries during this period being the Bonnie Glen, Pigeon Lake, and Fiveland fields, producing from Devonian D3 reef sections, Bonnie Glen having a 312-ft oil column and 288-ft gas cap.

Gas production in the Peace River district comes mainly from the Fort St John field discovered in March 1952, the estimated reserves for the whole district being about 1·3 trillion cu. ft.

Tables show the results of exploratory drilling and also the crude oil production up to Sept. 1952. W. S. R.

1123. The oilfields of Borneo. Anon. *Petroleum, Lond.*, Apr. 1953, **16** (4), 93–4.—Reviews the progress made by Shell in the exploitation of the Borneo oilfields. The older oilfield at Miri in Sarawak produces only 50,000 tons a year compared with 170,000 tons a year before the war. The most important oilfield is that at Seria in the State of Brunei, which yields 2 crudes, a waxy and a non-waxy type. Production is now 14,000 tons/day. Total production is over 5 million tons/year compared with a total output of 914,000 tons in 1938. A new refinery has been built at Lutong which treats the Seria and Miri crudes at an annual rate of 2 million tons, the balance being shipped overseas. R. E. P.

1124. Petroleum in England. Anon. *Petroleum, Lond.*, Apr. 1953, **16** (4), 100–3.—Briefly describes activities of the AIOC in the search for oil in England during the last 30 years. Present production is about 55,000 tons per annum. R. E. P.

1125. Patents. U.S.P. 2,613,250 (6.10.50; 7.10.52). H. L. Bilhartz and H. F. Dunlop, assrs to Atlantic Refining Co. A method of determining the variation of electrical resistivity of an earth sample with brine saturation, includes applying pressure to the sample to reduce the brine saturation thereof.

U.S.P. 2,614,334 (9.7.51; 21.10.52). A. B. Hildebrandt, assr to Standard Oil Development Co. A inclinometer for bore holes having a pendulum and also mirrors, a source of light, and a photo-sensitive cell, the illumination of which is a measure of the degree of inclination.

U.S.P. 2,614,633 (8.10.47; 21.10.52). O. T. Broyles, assr to Associated Engineers Inc. A well tool for punching an orifice bushing into a pipe in a well.

U.S.P. 2,614,881 (12.5.50; 21.10.52). J. A. Holland. Well fishing tool comprising a tubular housing having therein a pivoted, spring-urged, upwardly directed tongue or pawl to engage with, and retain, objects within the tubular casing.

U.S.P. 2,615,080 (2.12.48; 21.10.52). H. A. Mathews, M. B. Riordan, and L. B. Scott, assrs to Byron Jackson Co. Sound indicator and fluid level indicator for wells.

U.S.P. 2,615,401 (28.6.47; 28.10.52). T. M. Mock. A deep well liquid pump for pumping sand-laden oil having valve seats located so that they are out of the direct line of flow of the sand-laden oil. D. A. R.

Transport and Storage

1126. Gasoline resistant tank coatings. W. W. Cranmer. *Petroleum, Lond.*, Mar. 1953, **16** (3), 68–73; Apr. 1953, **16** (4), 91–2; *Corrosion*, 1952, **8** (6), 195–204. (*Presented at the Marine Industry Symposium* 1952 *of the U.S. National Assoc. of Corrosion Engrs.*)—To determine the most suitable air-drying paints for the protection of steel gasoline tanks in U.S. Navy tankers, a large number of coatings has been tested at the Philadelphia Naval Shipyard industrial test laboratory, and a vinylidene chloride–acrylonitrile copolymer (*Saran* type) has been selected for active use as a result. This paper describes tests which have been carried out, considers the problem of coating underground concrete gasoline storage tanks, and reviews methods of surface preparation, ventilation and safety precaution, and also of costs. In addition, methods other than coatings which have been investigated to reduce the corrosion problem are surveyed. (Author's abstract.) R. E. P.

1127. An all-gas turbine 18,000-ton tanker. Anon. *Mot. Ship*, Mar. 1953, **33** (396), 515.—Some details are given of the gas turbo-electric machinery installation for the tanker commissioned by the Anglo-Saxon Petroleum Co. The ship will have two gas-turbine-driven alternators supplying current to two electric motors which will drive a single propeller shaft through a two-pinion, single-reduction gearbox. Each of the turbines will develop 4150 b.h.p; they will be of the open-cycle type and will be designed to operate on boiler fuel. U. M.

1128. Patents. U.S.P. 2,614,578 (24.1.51; 21.10.52). W. C. Stickney, assr to Gulf Research and Development Co. A buoyancy type liq metering device having means for sensing a free floating position of a float with and without an applied downward force, and in which the predetermined quantity of liq between the free floating positions of said float may be metered.

U.S.P. 2,614,582 (6.8.47; 21.10.52). T. A. St Clair, assr to Phillips Petroleum Co. A relief valve having two concentric seats and means to supply pressure fluid to the valve to force a sealing ring into sealing engagement with the outer of the concentric seats.

U.S.P. 2,615,335 (15.7.49; 28.10.52). E. T. Young, assr to Sun Oil Co. Pipeline metering device having means to protect the bearing of a shaft operating transmission gearing for a flow indicator.

U.S.P. 2,165,338 (16.8.46; 28.10.52). E. R. Kilsby, assr to Foster-Wheeler Corpn. A liq level indicator for indicating the level of vapour-laden liq in a vapour and liq drum of a vapour generator.

U.S.P. 2,615,340 (3.5.51; 18.10.53). H. A. Quist, assr to Sun Oil Co. A device for selectively sampling liq bodies comprising a closed receptacle having apertures therein adjacent to the top and bottom thereof, vanes pivotally mounted on opposite sides of the receptacle and closure means for the apertures adapted to respond to the movements of the vanes.

U.S.P. 2,615,413 (28.1.49; 28.10.52). O. P. Adams and R. G. Mayer, assrs to United States Steel Co. A device for holding a pipe section in alignment with a pipeline.

U.S.P. 2,615,114 (28.1.49; 28.10.52). O. P. Adams and R. G. Mayer, assrs to United States Steel Co. An inner clamp aligning a pipe section with a pipeline and having a number of shoe segments to engage the interior of the pipe upon the inflation of an inflatable bag.

U.S.P. 2,615,743 (20.1.47; 28.10.52). L. S. Hamer, assr to P. A. Denhirst. Blinding device for pipelines. D. A. R.

U.S.P. 2,616,586 (26.8.48; 4.11.52). M. A. Lamb, assr to Chicago Pump Co. Floating cover for tanks.

U.S.P. 2,617,134 (18.11.48; 11.11.52). H. M. Barton, assr to Phillips Petroleum Co. Locatable pipeline scraper.

U.S.P. 2,617,302 (France 23.6.47; 11.11.52). L. Massiot, assr to Compagnie Française de Raffinage S.A. Device for measuring the water level in the bottom of hydrocarbon storage tanks.

U.S.P. 2,619,252 (Argentine 5.6.48; 25.11.52). F. de Hoffmann. Storage tank for inflammable liq having a partitioned floating closure. J. M. S.

Refinery Operations

Refineries and Auxiliary Refinery Plant

1129. Modern refining in Mexico. Pt I. D. P. Thornton. *Petrol. Process.*, 1953, **8** (2), 217–27.—The rate of growth in petroleum utilization in Mexico is quite striking; in 1951 over 150,000 b.d. were consumed, this being three times the intake of 13 years ago. The Mexican oil industry should not be compared with that of the U.S., although their processing techniques and modes of distribution are similar. Different co-existing requirements are imposed by the economy, sociology, and geography of the two countries.

The general organization of Mexico's entire government-owned oil industry, Petroleos Mexicanos (Pemex), is discussed at length, and a chart of the organization of the refining department is presented.

The Mexican oil industry has many problems, some worldwide, and some domestic. The latter are due to the rapid industrialization of Mexico, together with the serious lack of coal reserves.

Many features are given of the modern Mexican plants and operations at Atzcapotzalco, Reynosa, Salamanca, Poza Rica, and elsewhere. These include the lub oil and wax production facilities, together with their rated capacities. J. W. H.

1130. Refining in Mexico. Pt II. Crudes are tough to handle. D. P. Thornton. *Petrol. Process.*, 1953, **8** (3), 373–6.—Pemex operates 8 refineries, a large natural gasoline plant, and sulphur recovery facilities. Of these 8, 2 have been in operation only since 1950, a third was rebuilt in 1947, the remainder are pre-1938. All of these refineries are listed in tabular form with their respective throughput figures.

Crude production in Mexico at present is approx 250,000 b.d., but an increased capacity of 68,000 b.d. is expected in the next few years. Most Mexican crudes are paraffinic and asphaltic in nature, *i.e.*, mixed base. Their sulphur and salt contents sometimes reach a high figure. The salt figure of some crudes as produced exceeds 500 lb/1000 brl.

The "Central Area" plants of Mexico are discussed in detail. At Poza Rica, the only modern natural gasoline plant in Mexico, the total crude production amounts to 140,000 b.d., of which 25,000 b.d. may be considered as being very salty. A typical analysis of Poza Rica crude is given. J. W. H.

1131. Maintenance of centrifugal pumps. F. B. Applegate. *Oil Gas J.*, 30.3.53, **51** (47), 187; 6.4.53, **51** (48), 121.—This issue of the Engineering Reference Section deals with pump design, selection, and installation. The following part shows how to detect trouble signs and illustrates new, damaged, and worn parts of a centrifugal pump. G. A. C.

1132. Gas turbines and centrifugal compressors—6. T. R. Rhea and J. S. Quill. *Oil Gas J.*, 16.3.53, **51** (45), 147.—Starting, operating, and stopping procedures for this equipment are outlined. G. A. C.

1133. Heating tube failures. J. J. B. Rutherford. *Oil Gas J.*, 16.3.53, **51** (45), 155; 30.3.52, **51** (47), 189; 6.4.52, **51** (48), 123.—This number of the Refiner's Notebook gives case histories of tube failures and results of laboratory examinations. Figs show grain structure and tube defects.

The following issue deals with tube failure from mechanical causes such as cracks and defective welds.

The series continues with more information on mechanical failures, giving instances with photographic illustrations. G. A. C.

1134. Evaluation of radiant heat absorption rates in tubular heaters. Pts II and III. L. A. Mekler and R. S. Fairall. *Petrol. Refin.*, Nov. 1952, **31** (11), 128–32; Dec. 1952, **31** (12), 151–5.—The methods are described and examples given for the calculation of heat absorption rates by direct radiation and re-radiation.

The relative radiant heat absorption characteristics for each bank of tubes in various types of furnaces are calculated and discussed. A. R. H.

1135. Heat transfer. B. E. Lauer. *Oil Gas J.*, 23.3.53, **51** (45), 153; 30.3.53, **51** (47), 198.—Pt 28 of this series continues with coeff of heat transfer through film between outside surface of a cool tube and a warm gas.

Pt 29 deals with coeff of heat transfer through film between outside surface of a cool tube and a warm gas. G. A. C.

1136. Shortcut to heat exchanger design—II and III. C. H. Gilmour. *Chem. Engng*, 1953, **60** (3), 226–9; 1953, **60** (4), 214–18.—References should be made to *Chem. Engng*, 1952, **59** (10), 144, for the first article, which developed a basic method for design. Here, the method is applied to conditions of no phase change, forced convection, turbulent flow, and parallel flow in shell.

Pt III deals with the design of heaters and condensers in which the condensing vapours contain only a small amount of superheat or non-condensible vapour. D. M.

1137. The practical basis for the design of heat exchangers. B. E. Eltham. *Mech. World*, Mar. 1953, 133 (3404), 107.—General constructional details of shell and tube type heat exchangers are commented on. The selection of optimum tube velocities and the effect of baffle design on the performance of exchangers are discussed. T. T.

1138. Thermal insulation for industrial requirements. Pts VIII, IX, X. R. Thomas. *Petrol. Refin.*, Nov. 1952, **31** (11), 151–5; Jan. 1953, **32** (1), 107–10; Feb. 1953, **32** (2), 97–8.—The use of metallic materials for reflective insulation is discussed.

In Pt IX methods for the calculation of the thickness of insulation are presented.

The final instalment details the needs of the insulation field and offers recommendations for solutions to the problems. Progress towards standardization is reviewed and the need for trained thermal insulation engineers stressed. R. D. S.

1139. Measuring catalyst flow rates in catalytic crackers. D. E. Hull and R. R. Bowles. *Oil Gas J.*, 23.3.53, **51** (46), 295.—Method involves measurement of time interval required for radioactive bead to pass between two points, such that intervening weight of cat is accurately defined. G. A. C.

1140. New developments in automatic control. J. F. Draffen. *Petrol. Refin.*, Dec. 1952, **31** (12), 121–5.—Recent developments include the reduction of lag, continuous infra-red analysers, force balance instruments, and electronic controllers. A. R. H.

1141. Control valves, design and use. D. E. Hostedler. *Petrol. Refin.*, Dec. 1952, **31** (12), 116–20.—The applications, accessories, and selection of air-actuated control valves are discussed. A. R. H.

1142. What is good instrumentation worth? G. W. Wilson. *Petrol. Refin.*, Dec. 1952, **31** (12), 126–9.—Instances are described where improvement of instrumentation greatly improved the performance of units. A. R. H.

1143. Design of rectangular footings. C. H. Fork. *Petrol. Refin.*, 1953, **32** (2), 110–11.—Extension of the principles applied to square footings in an earlier article. Gives a rapid graphical method for the design of rectangular stack and tower foundations, using the same set of equations for both axes of the footing. R. D. S.

1144. Applying graphical methods to square footing designs. C. H. Fork. *Petrol. Refin.*, Nov. 1952, **31** (11), 145–50.—A method is presented for the design of square footings for supporting tanks, columns, etc., which eliminates much of the usual trial-and-error procedure. A. R. H.

1145. How flanges work and why they leak. R. G. Blick. *Petrol. Refin.*, 1953, **32** (1), 129–35. (*ASME Tulsa, Sept.* 1951.)—The important factors in joint design are reviewed and recent test data compared with previous work. A new formula is presented for the design of flanges with wide gaskets. A. R. H.

1146. How to apply the method of slope deflection to thermal stress analysis of piping. E. A. Picardi. *Petrol. Process.*, 1953, **8** (3), 368–72.—The demand for safe and economical piping designs for refinery and petrochemical processes caused by the use of higher temp and pressures requires accurate stress analyses of all or part of each system. One method lending itself to the analysis of piping systems if that of slope deflection. This method has many advantages, and the basic equation is easily used.

2 examples are presented of this method, in each case the bending moment diagram and the elastic curve are drawn, and also the anchor thrusts and the bending stresses are computed in the normal manner. J. W. H.

1147. Creep strength of stainless steels. W. L. Nelson. *Oil Gas J.*, 30.3.53, **51** (47), 195.—Creep strength of chromium and chromium–nickel steels (to 9% chromium) with their compositions are tabulated. G. A. C.

1148. Design of cooler condensers for vapour–gas mixtures. G. H. Bras. *Chem. Engng*, 1953, **60** (4), 223–6.—Primarily, a graphical method for the design of cooler condensers for handling mixtures of non-condensible gases and saturated and non-saturated vapours. D. M.

1149. Electric power for refineries. R. F. Lawrence and H. B. Thacker. *Petrol. Process.*, 1953, **8** (3), 364–7. (*Condensed from paper, presented at G.M. of Amer. Inst. Elec. Engrs, N.Y., U.S.*)—Because a considerable quantity of steam is used in every refinery, one of the major power problems is obtaining a proper balance between the steam load and the electrical load. The various aspects of the power generation problem, such as bussing arrangements, reliability, voltage class, ties to electric utility systems, and, in particular, circuit breaker systems, are the main subject of the paper.

The 10 basic forms of the distribution system arrangements are outlined, together with the many distribution problems in refinery operation. J. W. H.

1150. How to chemically clean refinery equipment. G. L. Farrar. *Oil Gas J.*, 23.3.53, **51** (46), 211.—Analysis of scales or deposits should be carried out before chemical cleaning is undertaken and suitable solvents and inhibitors chosen. Type of metal to be cleaned is important. Case histories are given. G. A. C.

1151. Chemical cleaning is a versatile tool. T. N. Griswold and J. O. Thoen. *Oil Gas J.*, 23.3.53, **51** (46), 236.—Cleaning procedures for heat exchangers, water-cooled units, oil-to-oil exchangers, and towers are outlined, and various types of chemical cleaning devices described. G. A. C.

1152. How to select compressors. L. J. Murphy. *Petrol. Refin.*, 1953, **32** (2), 115–18.—The choice between light, medium, or heavy duty compressors for refinery use is examined in the light of the efficiency of the distribution system and the air demand.

Types of compressor cooling, staging capacity control, and forms of drive are also considered and a typical cost calculation given. R. D. S.

1153. Two erection practices speed refinery completion. A. McCone. *Petrol. Refin.*, Jan. 1953, **32** (1), 114–15.—In the erection of a Houdriflow cat cracking unit, the stairwell and elevator shaft was first constructed and used as a pedestal for the guy derrick, eliminating the cost of erection, depreciation, and dismantling of a separate pedestal. The structure was 360 ft high and supported a 25-ton derrick with a 100-ft beam.

Accurate delivery dates were obtained for all major items established on a schedule which would permit the proper sequence of work, thus reducing equipment handling and storage to a minimum. A. R. H.

1154. Tooling for refinery maintenance. H. S. Selindh. *Petrol. Refin.*, Jan. 1953, **32** (1), 125–8 (*ASME Conf, Kansas City, Sept.* 1952).—Considerable savings can be made by good tooling, thus reducing the time required for maintenance. On inspection special emphasis is placed on the design of units. A single large maintenance building containing stores and equipment with an overhead crane and modern facilities considerably reduces maintenance costs. A. R. H.

1155. Patents. U.S.P. 2,614,031 (14.4.50; 14.10.52). R. B. Tickler, assr to Standard Oil Development Co. Liq–liq extraction tower having transverse plates in zig-zag formation defining mixing and settling zones.

U.S.P. 2,614,064 (31.10.49; 14.10.52), S. C. Carney, assr to Phillips Petroleum Co. Liq–liq contracting apparatus has particles in the mixing zone which are alternately forced towards the light liq zone by a magnetic field and towards the heavy liq zone by centrifugal force.

U.S.P. 2,614,823 (24.8.48; 21.10.52). R. Berkemeyer, assr to Phillips Petroleum Co. Pebble heater apparatus.

U.S.P. 2,614,824 (11.10.48; 21.10.52). L. J. Weber, assr to Phillips Petroleum Co. Pebble heat exchanger.

U.S.P. 2,615,792 (13.8.48; 28.10.52). G. J. Bacsik, assr to Standard Oil Development Co. Apparatus for contacting and separating two substantially immiscible liquids of dissimilar sp. gr.

U.S.P. 2,615,793 (22.8.49; 28.10.52). J. A. Weedman, assr to Phillips Petroleum Co. A fractional crystallization apparatus comprising an elongated closed container having a heated end and a cooled end, a product outlet at each end, a feed inlet intermediate to the ends, and means for moving granular material through the container from the cooled to the heated end.

U.S.P. 2,615,796 (17.2.51; 28.10.52). N. P. Peet, assr to Standard Oil Development Co. Vessel for fluid cat reaction with means for varying the height of the dense phase. D. A. R.

U.S.P. 2,616,514 (20.9.48; 4.11.52). H. E. Shobe, assr to Phillips Petroleum Co. Apparatus for removing gas and liquid from a vessel.

U.S.P. 2,616,653 (15.9.47; 4.11.52). T. A. Tarr, assr to Phillips Petroleum Co. High-pressure fluid shut-off valve.

U.S.P. 2,617,763 (8.4.49; 11.11.52). K. A. Fischer. Electrostatic filter for paraffins comprising a woven sheet material of insulated conductor warp threads (1) and non-insulated conductor filling threads (2), (1) being attached to a common electrical pole and (2) being attached to a common electrical pole of opposite polarity so that (1) is positively charged and (2) negatively charged.

U.S.P. 2,619,077 (23.12.49; 25.11.52). O. C. Schauble and E. F. Tibbetts, assrs to Lummus Co. Tube support for heaters.

U.S.P. 2,619,187 (11.12.50; 25.11.52). C. W. Hayes and J. G. Martin, assrs to Black, Sivalls and Bryson Inc. Gas and liq separating apparatus.

U.S.P. 2,619,280 (25.10.48; 25.11.52). O. Redlich, assr to Shell Development Co. Centrifugal contractor for two immiscible liquids having different densities.

J. M. S.

Distillation

1156. Equilibrium flash vaporization of petroleum fractions. K. Keith, A. Okamoto, and M. Van Winkle. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 429–39.—An apparatus was developed to obtain equilibrium flash vaporization data at reduced pressures. It employed an atomizing nozzle for increasing the contact surface area between liq and vapour phases, and was tested between 10 and 760 mm Hg. Data at pressures between 10 and 400 mm Hg were obtained for 6 petroleum fractions, and a correlation made between flash vaporization data and atm ASTM dist data. The studies should prove of value in the design of commercial units. E. J. C.

1157. Evaluation of vacuum rectification columns. J. Feldman, A. Svedi, S. Connell, and M. Orchin. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 214–15.—1- and 2-monomethyl-naphthalene mixtures are reported to be useful as binary test mixture from 10 to 760 mm. E. J. C.

1158. Froth and foam—the bases for tower sizing. F. A. Zenz. *Petrol. Refin.*, 1953, **32** (1), 150–4.—A fundamental method is presented for determining tray dia and spacing, and design method laid out in the form of charts. The tray area is determined by the vapour velocity through the slots and the spacing by the height of foam above the liq. A. R. H.

1159. The practical design of a tube still. J. McLaren. *Petroleum, Lond.*, Apr. 1953, **16** (4), 104–5.—Describes a method of designing a tube still which has proved itself in a continuous dist plant. Full details are given of the method, which depends on the applicability of the empirical equation developed by Wilson, Lob, and Hottel, viz.,

$$\mu = \frac{1}{1 + G\frac{\sqrt{Q\alpha Acp}}{4200}}$$

where μ = fraction of total heat in fuel adsorbed by cold surface in combustion chamber;
G = lb air/lb fuel burnt;
α = fraction of radiant heat adsorbed by tube surface as compared to that received by the phase replacing them;
Acp = area of plane in which tube rows lie, sq. ft.; and
Q = total heat input to combustion chamber in fuel, B.Th.U/hr. R. E. P.

1160. Applied distillation. K. E. Coulter. *Petrol. Refin.*, Nov. 1952, **31** (11), 156–8; Dec. 1952, **31** (12), 137–8.—Dehydration and steam dist are briefly described.
The control of dist columns is briefly discussed. A. R. H.

1161. Applying statistical quality control to crude oil distillation. A. C. Dorenfeld, L. J. McGovern, and G. W. Wharton. *Petrol. Refin.*, Dec. 1952, **31** (12), 147–50.—Dist data on a dist column were collected over a period of 8 months and analysed statistically. An empirical equation has been developed relating the kerosine end-point to the other product yields and temp. Application of this type of equation ensures that the operating conditions are changed only when product changes are not due to chance but to assignable causes, and necessary changes can be made in a predetermined pattern. A. R. H.

1162. Multicomponent distillation. M. van Winkle. *Oil Gas J.*, 23.3.53, **51** (46), 182.—Methods for designing and checking dist column performance are given with necessary illustrations. Methods take into account liq and vapour loading, tray layout, and riser and downcomer design and sizing. G. A. C.

1163. To help you design fractionators. R. R. White. *Petrol. Process.*, 1953, **8** (3), 357–62.—An extension to graphical techniques to multicomponent systems is presented with primary emphasis on ternary and quaternary systems. The graphical approach to dist problems is important, not because of greater accuracy or ease of calculation, but because it shows pictorially the important factors and their inter-relationship.

Binary and ternary systems of const relative volatility and const mol overflow are discussed for the sake of simplicity. In order to clarify the discussion, an example problem is solved, giving the minimum reboil ratio, and the minimum number of stages at total reflux, together with the stage requirements at an intermediate reflux ratio.

Analytic relations for the number of stages will be considered in future articles.

J. W. H.

1164. Fractionation calculations for existing columns. H. E. Rea and D. N. Hanson. *Petrol. Refin.*, Nov. 1952, **31** (11), 139–43.—The various applications of the Thiele–Geddes method are discussed, and it is shown that the method is particularly useful for calculations on existing columns. The assumption of a temp gradient rather than trial-and-error estimations of each plate temp reduces the calculations. A. R. H.

1165. Here's the story of the new turbogrid distillation trays. Anon. *Petrol. Refin.*, Nov. 1952, **31** (11), 105–8.—The turbogrid trays are described and discussed in comparison with bubble cap trays and relative efficiency data presented. Their advantages include about 40% higher capacity for the same separation per ft of tower height, 40 to 80% lower pressure drop, lower liquid hold-up, lower installed cost, and easier column control. Grid trays show no advantages when a two- or three-fold range in feed rate is required, and are not recommended when a high hold-up time is required.

A. R. H.

1166. Process design and operation of multicomponent hydrocarbon stripping. R. H. Parekh. *Petrol. Refin.*, Nov. 1952, **31** (11), 99–103.—The important factors which affect the design and operation of rich oil rectification and stripping systems have been analysed theoretically. The energy consumed by the rich oil heater and stripping steam boiler is taken as a measure of the degree of stripping, and an increase of 15% in the stripping energy gave a 0·5% increase in the hydrocarbon recovery. An appreciable loss of pentanes and heavier constituents can occur if the concentration of these components in the absorber oil becomes excessive due to inefficient stripping. Higher stripping temp reduce the quantity of stripping steam required, but higher temp operation is not very advantageous, due to increase in other heat and condenser requirements and loss of lean oil. For recovery of 50% propane or more, stabilization of the rich oil before stripping becomes an important requirement. A. R. H.

1167. Patents. U.S.P. 2,613,174 (13.8.49; 7.10.52). C. E. Ockert, assr to Sun Oil Co. A dist method of recovering furfural from a mixture consisting mainly of furfural contaminated with less volatile hydrocarbons and acidic furfural derivatives.

U.S.P. 2,613,176 (26.2.47; 7.10.52). A. W. Goldsbarry and M. S. Agruss. Falling film type of vac still with rotating partial condenser.

U.S.P. 2,613,201 (21.4.47; 7.10.52). J. Anderson, J. W. Mecorney, and G. E. Ham, assrs to Shell Development Co. A dist process for concentrating partially polymerized diallyl phthalate.

U.S.P. 2,614,070 (16.11.49; 14.10.52). W. M. Smith, assr to Standard Oil Development Co. C_4 to C_{15} OXO alcohols are purified by treating in a high pressure dist stage, heat-treating to thermally decompose impurities, removing volatile impurity products, and finally treating in a low pressure dist zone from which the alcohols are removed as overhead products.

U.S.P. 2,614,115 (22.9.48; 14.10.52). W. E. Catterall and E. O. Ohsol, assrs to Standard Oil Development Co. A process for separating and recovering neutral low mol. wt. oxygenated products in an effluent from a synthesis reaction in which H_2 and CO are the reactants, comprising a succession of condensation and separation steps, followed by scrubbing and dist.

U.S.P. 2,614,128 (31.12.49; 14.10.52). J. K. Mertzweiller, assr to Standard Oil Development Co. An improved continuous dist process for the purification of an impure primary C_8 *iso*-octyl alcohol obtained by the OXO process from a C_7 olefin, CO, and H_2, and subsequently hydrogenating the resulting C_8 aldehydes, which contains high-boiling thermally unstable impurities, including acetals, esters, hemiacetals, and ethers.

U.S.P. 2,614,970 (26.9.49; 21.10.52). C. E. Morrell and J. Stewart, assrs to Standard Oil Development Co. Aldehydes and alcohols are recovered from OXO reaction products by simultaneous hydrolysis and extractive dist in the presence of an aq acid soln containing at least 20% by wt of a water soluble salt of a mononuclear aromatic sulphonic acid.

U.S.P. 2,615,912 (7.4.49; 28.10.52). V. F. Michael, assr to Stanolind Oil and Gas Co. A method for separating and purifying oil soluble carboxylic acids from an aq mixture consisting essentially of salts derived from these acids. D. A. R.

U.S.P. 2,617,272 (U.K. 3.12.46; 11.11.52). A. A. Aicher, assr to Petrocarbon Ltd. Gases are separated by cooling, followed by fractionation at low temp in which heat, withdrawn during a cooling operation, is transferred for use in a heating operation by means of a circulating heat carrier, which is evaporated and condensed alternately in a closed circuit. Two such closed circuits are employed, and they are linked thermally so that the balance between the amount of heat withdrawn and the amount of heat introduced by the second circuit is made up by evaporation of part of the heat carrier in the first circuit in indirect contact with condensing vapour of the heat carrier in the second circuit.

U.S.P. 2,617,276 (23.6.50; 11.11.52). C. D. Gard and L. L. Laurence, assrs to Union Oil Co. of California and Black, Sivalls and Bryson Inc. Liquefiable hydrocarbons are separated from natural gas, produced at pressures above the lower limit of the retrograde condensation range, by reducing the pressure to the said lower limit, by expanding the gas in at least two steps, separating condensed liquid from each expansion step, and refrigerating the gas prior to the last expansion step by heat exchange with the gas withdrawn from the succeeding separation.

U.S.P. 2,617,756 (20.5.50; 11.11.52). T. Q. Eliot, assr to Stanolind Oil and Gas Co. Propionaldehyde is recovered from aq mixtures thereof by subjecting the mixture to dist under superatm pressure. A water–propionaldehyde azeotrope distils, leaving anhydrous propionaldehyde as residue.

U.S.P. 2,617,757 (2.8.47; 11.11.52). V. F. Michael, assr to Stanolind Oil and Gas Co. Mixtures of methyl propyl ketone with ethyl or *n*-propyl alcohol are separated by fractional dist in the presence of water and a hydrocarbon having 6 to 8 carbon atoms. A ternary azeotrope of the alcohol, water, and hydrocarbon is the overhead fraction.

U.S.P. 2,617,758 (France 13.7.44; 11.11.52). L. Massiot, assr to Compagnie Française de Raffinage S.A. Mixtures of vapours of normally immiscible liqs, which form a eutectic mixture, are separated by condensing a substantial proportion of the component present in excess of the proportion required to form the eutectic mixture in a primary condensation zone (1) maintained at the temp of the dew point of the eutectic mixture by vaporizing, in indirect heat relationship with the mixture of vapours, a cooling liquid consisting of the eutectic mixture, passing uncondensed vapours of the vapour mixture and the vapours of the cooling liquid to a secondary condensation zone (2), and passing a portion of the eutectic mixture condensed in (2) to (1) as the cooling liquid.

U.S.P. 2,617,760 (U.K. 19.12.47; 11.11.52). G. Burrows, assr to Metropolitan-Vickers Electrical Co. Short path fractionating centrifugal still.

U.S.P. 2,618,591 (12.10.48; 18.11.52). J. R. Anderson, assr to Koppers Co. Purification of benzene by fractional dist with an added non-aromatic hydrocarbon boiling between 75° and 85° C to obtain an overhead azeotrope of benzene and the added hydrocarbon and dist the azeotrope with methanol to leave pure benzene as the residue.

U.S.P. 2,619,336 (2.2.49; 25.11.52). C. J. Schilling, assr to Air Products Inc. Bubble plate for use in gas–liq contact columns comprising a diaphragm extending from wall to wall of the column, a plurality of drain tubes projecting above the diaphragm to maintain at least one liq pool thereon, a flexible skirt around the periphery of the diaphragm extending upwardly, and means for extending the skirt outwardly for sealing with the walls of the column.

U.S.P. 2,619,337 (26.4.47; 25.11.52). C. W. Blazer, assr to Lummus Co. Dist column trays.

U.S.P. 2,619,453 (Denmark 24.4.46; 25.11.52). R. Anderson. Vapour–compression dist. J. M. S.

Ger.P. 859,138, 23.10.52. W. Kiefer. Installation for heating liq above the b.p. given for atm pressure, *e.g.*, for chem purposes.

Ger.P. 859,140, 23.10.52. A. Haltmeier, assr to Farbenfabriken Bayer. Process for separating volatile materials from liq.

Ger.P. 859,290, 23.10.52. K. C. D. Hickmann, assr to Eastman Kodak Co. Process and installation for unobstructed fractionation in high vac.

Ger.P. 858,985, 16.10.52. R. Christiansen. Continuous extraction installation.

Ger.P. 858,155, 9.10.52. K. Pletke. Extraction apparatus.

BrennstChemie, 1952, **33** (21–22). R. T.

Absorption and Adsorption

1168. Separating aromatics by Arosorb process. F. R. Shuman and D. G. Brace. *Oil Gas J.*, 6.4.53, **51** (48), 109.—This process uses silica gel adsorption for removal of aromatics from paraffin and naphthene mixtures. Feed is stripped of aromatics in gel packed column, and then stripped feed is displaced by pentane. Aromatics are recovered by washing gel with an aromatic liq. G. A. C.

1169. Gas refrigeration plant designed to extract minimum of natural gasoline. R. B. McLaughun and C. P. Stanley. *Oil Gas J.*, 6.4.53, **51** (43), 103.—The gasoline plant of the Northern National Gas Co at Holcomb, Kansas, is designed to extract a minimum of natural gasoline from 185 million cu. ft/day of Hugoton field gas by refrigeration, thus preventing hydrocarbon condensate deficiencies whilst maintaining max heating value of the gas. G. A. C.

1170. Dehydration of natural gas and hydrocarbon liquids, Pt III. J. M. Campbell and L. Laurence. *Petrol. Refin.*, Nov. 1952, **31** (11), 109–16.—(See Abs. Nos. 352 and 3215 (1952).) The principal liq used as dessicants include: triethylene glycol, diethylene glycol, glycol–amine–water mixtures, calcium chloride, glycerine, lithium chloride, and sulphuric acid. The advantages and disadvantages of these are discussed, and the properties of di- and tri-methylene glycol are presented. The design and operation of plants using these 2 dessicants are discussed. A. R. H.

1171. Patents. U.S.P. 2,613,232 (14.11.49; 7.10.52). E. J. Janoski, assr to Sun Oil Co. Organic fluorides are removed from hydrocarbons by contacting with sulphuric acid containing a rare earth salt and a rare earth oxide.

U.S.P. 2,613,812 (11.7.47; 14.10.52). J. L. Yancey. Device for separating water from crude oil.

U.S.P. 2,613,813 (27.1.50; 14.10.52). C. A. Rodman and N. L. Tewksbury, assrs to Fram Corpn. Pyrolytic and oxidation contaminant products are removed from a hydrocarbon oil by contacting the oil with a product, obtained by reacting an alkylene polyamine with a fatty acid or a fatty acid glyceride, and collecting on a filter medium the contaminant–polyamine product adduct.

U.S.P. 2,614,133 (30.6.49; 14.10.52). E. E. Ockert, assr to Sun Oil Co. A continuous process for separating a liq charge mixture of organic compounds, including saturated and unsaturated compounds, by means of selective adsorption. D. A. R.

U.S.P. 2,616,513 (30.8.48; 4.11.52). E. A. McClendon, assr to Phillips Petroleum Co. Portable amine gas treater.

U.S.P. 2,616,515 (21.2.49; 4.11.52). C. H. O. Berg, assr to Union Oil Co. of California. Separation of gaseous mixtures using a solid granular adsorbent.

U.S.P. 2,616,521 (21.2.49; 4.11.52). C. H. O. Berg, assr to Union Oil Co. of California. Separation of gaseous mixtures using a solid granular adsorbent.

U.S.P. 2,616,829 (27.12.48; 4.11.52). C. H. O. Berg, assr to Union Oil Co. of California. Separation of liq hydrocarbons from gaseous mixtures using solid granular adsorbents.

U.S.P. 2,617,484 (14.11.49; 11.11.52). J. S. Swearingen. Recovering liq hydrocarbons from natural gas by means of an injected hydrocarbon liq containing dissolved hydrocarbon gas. The residual gas is conducted back to the earth.
J. M. S.

Ger.P. 858,097, 9.10.52. H. Zeiser, assr to Chemische Fabr. Weyl A.G. Process for separating mixtures of cryst tar hydrocarbons and oily materials.
BrennstChemie, 1952, **33** (21–22). R. T.

Solvent Extraction and Dewaxing

1172. What's happening in lubricating oil manufacture? E. F. King. *Oil Gas J.*, 16.3.53, **51** (45), 122.—Aspects such as deasphalting, extraction, and de-waxing operation, temp gradient effects, and recrystallization are dealt with in this review of operation of modern solvent refining processes. G. A. C.

1173. Patents. U.S.P. 2,614,065 (30.3.50; 14.10.52). K. H. Wanderer, L. H. Hays, and R. B. Selund, assrs to Standard Oil Development Co. A method of chilling a propane–oil–wax soln to obtain a wax slurry of improved filtrability comprises a temp reduction, flush chilling, pressure lowering, further chilling, and evaporative cooling.

U.S.P. 2,614,965 (28.7.50; 21.10.52). F. N. Ruehlen, assr to Phillips Petroleum Co. A method for the liq phase separation of hydrocarbons which comprises solvent extracting a mixture of hydrocarbons with at least one aliphatic carboxylic acid in which the aliphatic group is completely fluorinated.

U.S.P. 2,615,057 (30.8.51; 21.10.52). W. F. Wolff and C. E. Johnson, assrs to Standard Oil Co. Aromatic hydrocarbons are extracted from a hydrocarbon mixture with an ester of a thiolsulphonic acid containing from 2 to 20 carbon atoms per mol.
D. A. R.

U.S.P. 2,616,912 (8.7.48; 4.11.52). N. L. Dickinson, assr to M.W. Kellogg Co. Method of solvent recovery from extract phase where the solvent is a normally gaseous compound used in liquefied form. J. M. S.

Ger.P. 858,987, 16.10.52. E. Rammelkamp, assr to Metallges. A.G. Process and installation for extraction of solid material.

Ger.P. 858,873, 16.10.52. E. Jung and H. O. Lindgren, assrs to A.B. Separator Nobel. Process for centrifugal dewaxing of hydrocarbons.
BrennstChemie, 1952, **33** (21–22). R. T.

Cracking

1174. Catalytic cracking in the U.S.A. Anon. *Petroleum, Lond.*, Mar. 1953, **16** (3), 74–6.—Describes the advances that have been made in cat cracking which were given in a report published by OEEC in Paris as a result of the visit by a group of European experts to the American oil refinery drilling industries. Three types of cracking processes are described: (1) fixed bed cat: *e.g.*, Houdry, Cycloversion; (2) moving bed cat: *e.g.*, Thermofor, Houdriflow; (3) fluidized cat: *e.g.*, Fluid, Orthoflow. Details are given of cat regeneration, yields, and some physical properties of the products. R. E. P.

1175. Techniques for cat unit turnarounds. J. G. Traxler and K. T. Beavers. *Petrol. Refin.*, 1953, **32** (2), 112–14.—A full description of the methods used, including advance planning, supervisory staff line-ups, manpower co-ordination, and use of power tools, cranes, etc., wherever possible. Manways, oxygen supplies, and power points are installed on the plant to speed the turn-around. R. D. S.

1176. Cat cracking capacity increased by unusual methods. Anon. *Petrol. Refin.*, 1953, **32** (2), 135–7.—Describes how the capacity of two cat crackers was raised from 30,000 to 110,000 b.d. by careful study of all parts of the unit to remove all bottlenecks and to increase the throughput, especially by modification of auxiliary equipment.

Detailed engineering study to determine and remove limitations on each item was found to give the biggest increase in capacity. R. D. S.

1177. Reactions of hydrocarbons over cracking catalysts. E. M. Gladrow, R. W. Krebs, and C. M. Kimberlin, Jr. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 142–7.—Various cat were used to investigate cracking of hydrocarbons (*e.g.*, cetane). A silica–alumina cat produced the highest octane gasoline. Mechanism of reactions is proposed on the basis of carbonium ions. E. J. C.

1178. Hyperforming. C. Berg. *Petrol. Refin.*, Dec. 1952, **31** (12), 131–6.—This process carries out the reforming of straight naphthas and blends of straight run and cracked stocks with a moving bed, cobalt molybdate cat to increase the O.N. to 95 to 100 (Fl + 3 cc T.E.L.) with yields of the order of 90%. The operating conditions are 400 psi and 800° to 900° F with a recycle stream of hydrogen. External interheaters are employed to maintain the reaction temp. The cat is transported between the reactor and regenerator, utilizing a new principle called " Hyperflow " with a higher solid concentration than conventional fluid methods. Pilot plant data are presented, including product and utility balances, yield–O.N. curves, and analyses of feed and product. A. R. H.

1179. Clean out plugged catalyst with novel device. W. Rolf and D. W. Caswell. *Petrol. Refin.*, Nov. 1952, **31** (11), 127.—A device is described consisting of a long hollow lance to permit the use of live steam as a cleansing agent. A. R. H.

1180. Improve polyform operations with these correlations. R. C. Teitsworth. *Petrol. Refin.*, 1953, **32** (2), 91–4.—A relationship is developed between the max allowable percentage of naphtha in the furnace charge and the severity of operation. Application of this is claimed to give increased plant capacity without lowering product quality. Extension of the use of this relationship to other processes is also discussed. R. D. S.

1181. New hydroforming unit produces petrochemicals and avgas. J. J. Swift, S. R. Stiles, E. W. Howard, and M. Tarnpoll. *Petrol. Refin.*, 1953, **32** (2), 105–9.—Gives details of new hydroforming and aromatics extraction plant in Argentina. Includes flow diagrams, operating conditions, feed and product analyses, and yields for the production of toluene, benzene, and aviation gasoline. R. D. S.

1182. Pyrolysis of propane and butanes at elevated pressure. H. J. Hepp and F. E. Frey. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 410–15.—Apparatus and procedure described for cracking of hydrocarbons at pressures up to 2900 psig and temp of the order of 900° to 1100° F. Amongst the products were hydrocarbons that boiled in the gasoline range. E. J. C.

1183. How paraffin content affects quality of motor fuels from platforming. V. Haensel and G. R. Donaldson. *Petrol. Process.*, 1953, **8** (2), 236–9.—Two straight run naphthas with widely different paraffin contents have been compared by platforming in continuous bench scale units employing gas recirculation.

It is shown that the paraffin hydrocarbons in low naphthene content feed undergo extensive dehydrocyclization, thus contributing to the upgrading of the charge. The platforming of a high paraffin content stock results in a yield of 95% by vol at the initial O.N. of the low paraffin stock. The effect of pressure increase on high paraffin stock suppresses the aromatic production quite considerably at high conversion levels. The effect of increasing pressure on the platforming of the low pressure stock is that of suppressing aromatic formation to about the same extent throughout the conversion range studied. It is thus apparent that the production of aromatics by dehydrocyclization of paraffins is more sensitive to pressure variations than the production of aromatic from naphthenes. J. W. H.

1184. Pore structure of porous materials. P. Zwietering. *Ingenieur, 's Grav.*, 1953, **64** (8), 1–8.—Modern methods for obtaining detailed information on the pore structure of porous materials, *e.g.*, cat, are discussed. A pore is defined as a cylindrical

open space inside a solid having a radius smaller than 75,000 Å. The total pore volume is obtained by density measurements of the evacuated cat in mercury and helium. Of more importance is the total surface area per unit wt, as determined by the Brunauer–Emett–Teller method, making use of the N_2 or Ar adsorption isotherms. Experimental data are presented in 6 graphs and 3 types of curves discussed. In some instances it is of great importance to know the pore size distribution. The size of the macropores can be estimated from permeability measurements using the Kozeny equation. The micropore distribution has to be calculated from the isotherms. This can be done in a simple, classical way by means of the Kelvin v.p. equation, or by the more elaborate methods of Shull and Barret, based respectively on Gauss and Maxwell's distribution curves. Results obtained by those methods are compared, and the conclusion is reached that the classical method compares favourably with the more complicated Shull and Barret methods. Moreover, it is possible to make use of higher boiling liq, and distribution curves from H_2O, CCl_4, C_2H_5OH desorption isotherms correlate very well with those obtained from the N_2 and Ar curves. 13 graphs are included. G. F. T. C.

1185. Patents. U.S.P. 2,616,836 (29.12.49; 4.11.52). W. J. Schmidt and F. H. Blanding, assrs to Standard Oil Development Co. Heavy hydrocarbons are cat cracked so as to convert *ca* 30 to 40% into gasoline constituents, the products fractionated into gasoline, light furnace oil, and heavy cycle oil fractions, the aromatics extracted from the heavy cycle oil, and the extracted oil recycled to the cracker.

U.S.P. 2,617,708 (22.5.50; 11.11.52). N. E. Peery, assr to Shell Development Co. Gaseous fluids are contacted with fluidized solids in a plurality of separate parallel contacting zones separated by a stripping zone, the gaseous fluids and stripping medium being withdrawn as a common stream.

U.S.P. 2,617,709 (10.11.50; 11.11.52). P. W. Cornell, assr to Gulf Oil Corpn. In a fluidized cat process in which cat is continually added to the cat bed and cat is continually withdrawn from the bed suspended in the reaction products, the latter are cooled to form a liq cat slurry, and the cat is separated from the liq, regenerated, and returned to the process.

U.S.P. 2,618,074 (28.11.50; 18.11.52). R. P. Trainer and L. E. Border, assrs to Shell Development Co. Cat stripping apparatus in which two streams of powdered cat are mixed in a mixing vessel, the cat then descending over disk and doughnut baffles to the stripping zone, which is subdivided into cells by vertical baffles.

U.S.P. 2,618,535 (13.9.51; 18.11.52). R. P. Trainer and L. E. Border, assrs to Shell Development Co. Apparatus for fluidized cat cracking and regeneration of the cat.

U.S.P. 2,618,587 (22.4.48; 18.11.52). A. H. Schutte, assr to Lummus Co. Fluidized cat cracking and regeneration of the cat using flue gas and steam.

U.S.P. 2,618,613 (27.10.48; 18.11.52). C. N. Kimberlin and J. P. Bilisoly, assrs to Standard Oil Development Co. Spent silica–alumina cracking cat is reactivated by treatment with an aq soln of ammonium fluoride at 125° F for 1 to 3 hr, separating, washing, and drying the cat and steaming the dried cat for 24 hr at 1050° F at a pressure of 60 psi.

U.S.P. 2,618,614 (12.4.49; 18.11.52). M. S. Bielowski and J. M. Mavity, assrs to Universal Oil Products Co. A cat is made by mixing a phosphoric acid, a siliceous adsorbent, and a copper oxide, hydroxide, or salt, pelleting the mixture, and calcining the pellets at 500° to 1000° F.

U.S.P. 2,618,668 (14.7.49; 18.11.52). W. J. F. O'Connor and F. A. Rowen, assrs to Lummus Co. Cracking gaseous hydrocarbons to produce unsaturated hydrocarbons and hydrogen at *ca* 1400° F, the temp being varied according to the thermoconductivity of the product and of the charge.

U.S.P. 2,619,451 (28.12.48; 25.11.52). H. J. Ogorzaly and W. A. Rex, assrs to Standard Oil Development Co. Method of supplying heat to fluidized beds of solids.

U.S.P. 2,619,473 (14.5.46; 25.11.52). W. A. Wurth, H. Z. Martin, and C. E. Jahnig, assrs to Standard Oil Development Co. Regeneration of fluidized cat.

U.S.P. 2,619,474 (28.11.50; 25.11.52). C. L. Gutzeit, assr to Socony-Vacuum Oil Co. Hydrous alumina cat support made by pptn in the presence of, or subsequent contact with, a cyanide, cyanate, or thiocyanate. J. M. S.

Ger.P. 859,296, 23.10.52. F. Drexler and H. Lange, assrs to Bad. Anilin- & Soda-Fabr. Method for producing masses suitable for cat and adsorbents.

Ger.P. 858,839, 16.10.52. P. W. Reynolds, assr to ICI Ltd. Method for producing porous nickel–silicon cat.

Ger.P. 858,840, 16.10.52. H. Lange and R. Conrad, assrs to Bad. Anilin- & Soda-Fabr. Method for producing activated alumina for cat purposes.

Ger.P. 859,442, 23.10.52. A. Gemassemer, assr to Bad. Anilin- & Soda-Fabr. Process for reduction of pulverulent cat.

Ger.P. 858,843, 16.10.52. E. Donath and W. von Füner, assrs to Bad. Anilin- & Soda-Fabr. Method for producing activated alumina.

Ger.P. 859,152, 23.10.52. J. Davies, W. E. Huggett, and H. M. E. Steiner, assrs to Petrocarbon Ltd. Process for converting liq hydrocarbons into gases containing olefins and aromatic hydrocarbons.

Ger.P. 859,785, 23.10.52. W. Sexauer and O. Bär, assrs to Gastechnik G.m.b.H. Method for producing spherical contact and adsorbent bodies of const dia, suitable for desulphurization.

BrennstChemie, 1952, **33** (21–22). R. T.

Hydrogenation

1186. Producing ammonia synthesis gas. J. S. Bardin and D. W. Beery. *Petrol. Refin.*, 1953, **32** (2), 99–102. (*AICRE Tulsa. Oct.* 1952.)—Reviews the application of low temp nitrogen washing to hydrogen-rich gases, not only for the production of ammonia synthesis gas, but also for the production of streams containing over 98% hydrogen. Nitrogen scrubbing removes carbon monoxide and the bulk of the methane from the gas stream. Approx utility requirements and a flow sheet of the process are given. The possibility of separate recovery of valuable gas components other than hydrogen is noted. R. D. S.

1187. Germany's hydrogenation industry to-day. P. W. Sherwood. *Petrol. Refin.*, Nov. 1952, **31** (11), 93–8.—Coal hydrogenation plants in Germany which have now been converted to crude oil operation accounted for approx one-third of Germany's refining capacity in 1951. The hydrogenation process, which involves liq phase and vapour phase hydrogenation, is described. In the liq phase, iron sulphate and caustic soda, impregnated on a carrier such as lignite semi-coke, are used as a cat at pressures of 8300 to 10,300 psi and 860° to 895° F. The middle oil from the liq phase section is further processed over a tungsten sulphide cat at 4400 psi and 750° to 790° F. Gasoline yields in excess of 80% are obtained. The combination of hydrogenation and cat cracking is discussed. A. R. H.

1188. Patents. U.S.P. 2,619,450 (4.1.50; 25.11.52). H. W. Fleming, assr to Phillips Petroleum Co. Heavy residual hydrocarbons containing dissolved hydrogen are preheated to 500° to 700° F and treated with hydrogen at 800° to 900° F in the presence of a hydrogenolysis cat at 1000 to 6000 psi. The products are separated into hydrogen, C_1 to C_4 hydrocarbons, gasoline, gas oil, and residuum. The high purity hydrogen recovered is recycled to the process, the low purity hydrogen is used for temp control of the cat, and the residuum is recycled to the process. J. M. S.

Ger.P. 859,302, 23.10.52. H. Kölbel and E. Ruschenberg, assrs to Rheinpreussen A.G. für Bergbau und Chemie. Method for producing iron cat for carbon monoxide hydrogenation.

Ger.P. 858,244, 9.10.52. M. Pier and E. Donath, assrs to Bad. Anilin- & Soda-Fabr. Process to determine effects of cat in producing liq hydrocarbons by cat pressure hydrogenation of coals, tars, and mineral oils.

Ger.P. 859,444, 23.10.52. K. Goetze, assr to Bad. Anilin- & Soda-Fabr. Process and plant for continuous pressure hydrogenation of coals, tars, and mineral oils in liq phase.

Ger.P. 860,197, 30.10.52. H. Bähr, assr to Bad. Anilin- & Soda-Fabr. Process for dry dist of coals in connection with their pressure hydrogenation.
BrennstChemie, 1952, **33** (21–22). R. T.

Polymerization

1189. Patents. U.S.P. 2,613,197 (7.12.49; 7.10.53). T. R. Smith, assr to Maytag Corpn. A novel composition which is a solution of tetrabromethane and a polystyrene.

U.S.P. 2,613,199 (5.4.51; 7.10.52). P. A. D. Giorgio and M. M. Stafford. A heat convertible composition comprising a heat curable polymerized hydrocarbon-substituted polysiloxane and an aliphatic azo-compound.

U.S.P. 2,614,098 (25.11.49; 14.10.52). C. A. Uraneck and S. P. Landes, assrs to Phillips Petroleum Co. Synthetic rubber is produced by polymerizing a major proportion of 1 : 3-butadiene and a minor proportion of styrene in an aqueous medium between 10° and −40° C with a cat comprising di-*iso*propyl benzene hydroperoxide and sodium hyposulphite.

U.S.P. 2,614,137 (28.1.47; 14.10.52). A. J. Chenicek, assrs to Universal Oil Products Co. To increase the yield of a desired olefinic polymer from the products of polymerization of an olefinic monomer, polymerization products of higher and lower mol. wt. than the desired product are subjected to a disproportionation reaction in the presence of a siliceous adsorbent.

U.S.P. 2,614,969 (22.10.48; 21.10.52). C. E. Morrell and L. M. Welch, assrs to Standard Oil Development Co. Isoprene is separated from a mixture containing lower boiling pentenes and trimethylethylene by distilling an isoprene-rich cut containing the lower boiling pentenes with added *iso*pentane to leave the trimethyethylene as a residue and then fractionally dist the lower boiling pentenes from the isoprene-rich cut in the presence of a polar solvent which extracts the isoprene.

U.S.P. 2,615,004 (30.8.50; 21.10.52). G. E. Jasper and L. M. Welch, assrs to Standard Oil Development Co. Mineral-oil sol styrene–*iso*butylene copolymers of mol. wt. between 10,000 and 30,000 are prepared by using a Friedel–Crafts cat at a temp between −100° and −30° C and operating in the presence of a mixed diluent comprising an aliphatic hydrocarbon solvent and a chlorinated aliphatic hydrocarbon.

U.S.P. 2,615,009 (18.4.49; 21.10.52). W. M. St John and C. A. Uraneck, assrs to Phillips Petroleum Co. Synthetic rubber from 1 : 3-butadiene and styrene is prepared by effecting polymerization below 0° C in an aq medium containing between 10 and 30% sodium chloride and having a freezing point below the polymerization temp, the emulsion being of the oil-in-water type with potassium caprylate as the emulsifying agent and *tert*-butyl mercaptan as the polymer modifying agent.

U.S.P. 2,615,785 (20.12.49; 28.10.52). W. R. McClellan, assr to E.I. du Pont de Nemours and Co. Polyethylene terephthalate monofils are drawn and heat set for use as bristles.

U.S.P. 2,615,826 (2.8.46; 28.10.52). G. D. Mallory and T. R. Ten Broeck, assrs to Wingfoot Corpn. A composition comprising a copolymer of a 1 : 3-diene monomer and a vinylpyridine monomer, a rubbery copolymer of styrene and 1 : 3-butadiene and a phenol formaldehyde resin is used to form a bond between a cord and the vulcanized rubber in which the cord is embedded.

U.S.P. 2,615,856 (30.6.48; 28.10.52). H. S. Bloch, assr to Universal Oil Products Co. A composition comprising a natural or a butadiene rubber and an unsaturated polycyclic hydrocarbon residue boiling above 150° C as well as the product obtained by reacting sulphur with such a residue, as plasticizers.

U.S.P. 2,615,858 (6.2.50; 28.10.52). Dr L. E. Winkler, assr to Shell Development Co. An organosal composition comprising finely divided thermoplastic polymer of vinyl chloride suspended in a homogeneous liq vehicle containing hydrocarbons of

boiling range of 25° to 250° C and, as a plasticizer, a compatible ester and a high boiling aromatic petroleum extract.

U.S.P. 2,615,859 (7.3.47; 28.10.52). A. Gislon, assr to Compagnie Française de Raffinage S.A. A composition comprising a vinyl chloride polymer plasticized with a chloroalkylchlorobenzene.

U.S.P. 2,615,860 (G.B. 3.6.40; 28.10.52). A. R. Burgess, assr to ICI Ltd. A polyvinyl chloride or a solid polyethylene synthetic resin is stabilized by not more than 10% by weight of a nickel, copper, lead, or uranium chelate compound.

U.S.P. 2,615,864 (21.6.47; 28.10.52). J. J. Giammaria, assr to Socony-Vacuum Oil Co. The reaction product of a mixture of primary, saturated, aliphatic, monohydric unsubstituted C_8–C_{18} alcohols with a copolymer of alkyl benzoate and maleic anhydride.

U.S.P. 2,615,865 (13.9.49; 28.10.52). A. E. Ardis, assr to B.F. Goodrich Co. Copolymers of vinylidene cyanide and mono-olefins.

U.S.P. 2,615,866 (13.9.49; 28.10.52). H. Gilbert and F. F. Miller, assrs to B.F. Goodrich Co. Copolymers of vinylidene cyanide and vinyl esters.

U.S.P. 2,165,867 (13.9.47; 28.10.52). H. Gilbert and F. F. Miller, assrs to B.F. Goodrich Co. Copolymers of vinylidene cyanide and vinyl esters of aromatic acids.

U.S.P. 2,615,868 (13.9.49; 28.10.52). F. F. Miller, assr to B.F. Goodrich Co. Copolymers of vinylidene cyanide and styrene or a substituted styrene.

U.S.P. 2,615,869 (14.2.50; 28.10.52). V. L. Folt, assr to B.F. Goodrich Co. Copolymers of vinylidene cyanide and vinyl chloride.

U.S.P. 2,615,890 (14.2.50; 28.10.52). V. L. Folt, assr to B.F. Goodrich Co. Copolymers of vinylidene cyanide and vinylidene chloride.

U.S.P. 2,615,871 (14.2.50; 28.10.52). V. L. Folt, assr to B.F. Goodrich Co. Copolymers of vinylidene cyanide and an alkyl methacrylate.

U.S.P. 2,615,872 (29.4.50; 28.10.52). S. J. Averill, assr to B.F. Goodrich Co. Copolymers of vinylidene cyanide with halogenated butadiene–1 : 3-hydrocarbons.

U.S.P. 2,615,873 (29.4.50; 28.10.52). S. J. Averill, assr to B.F. Goodrich Co. Copolymers of vinylidene cyanide with aliphatic conjugated diolefins.

U.S.P. 2,615,874 (28.8.50; 28.10.52). H. Gilbert and F. F. Miller, assrs to B.F. Goodrich Co. Copolymers of rinylidene cyanide and propylene.

U.S.P. 2,615,875 (25.8.50; 28.10.52). H. Gilbert and F. F. Miller, assrs to B.F. Goodrich Co. Copolymers of vinylidene cyanide and *iso*propenyl esters.

U.S.P. 2,615,876 (25.8.50; 28.10.52). H. Gilbert and F. F. Miller, assrs to B.F. Goodrich Co. Copolymers of vinylidene cyanide and esters of α-halogen substituted acids.

U.S.P. 2,615,877 (25.8.50; 28.10.52). V. L. Folt, assr to B.F. Goodrich Co. Copolymers of vinylidene cyanide with 2-mono-halogenated mono-olefins.

U.S.P. 2,615,878 (27.10.50; 28.10.52). V. L. Folt, assr to B.F. Goodrich Co. Copolymers of vinylidene cyanide with 1 : 2-dihalo-ethylenes.

U.S.P. 2,615,879 (27.10.50; 28.10.52). V. L. Folt and H. Gilbert, assrs to B.F. Goodrich Co. Copolymers of vinylidene cyanide with α-substituted esters of acrylic acid.

U.S.P. 2,615,880 (27.10.50; 28.10.52). V. L. Folt, assr to B.F. Goodrich Co. Copolymers of vinylidene cyanide with alkyl acrylates.

U.S.P. 2,615,881 (4.10.51; 28.10.52). W. J. Sparks, R. M. Thomas, and D. C. Field, assrs to Standard Oil Development Co. Polymethylpentadiene synthetic rubber is produced by polymerization at a temp between −20° and −164° C in the presence of a Friedel–Crafts cat. D. A. R.

U.S.P. 2,616,875 (6.9.51; 4.11.52). J. W. Adams and J. A. Reynolds, assrs to United States Rubber Co. 1 : 3-butadiene or mixtures thereof with copolymerizable compounds containing a $CH_2{=}C{<}$ group are polymerized in aq emulsion using an alkylene polyamine–sulphur reaction product as a shortstopper.

U.S.P. 2,616,880–8 (10.7.51; 4.11.52). D. C. Seymour, L. F. Marous, M. H. Danzig, R. E. Comerford, and A. W. Fuhrman, assrs to United States Rubber Co. These patents are all concerned with short-stopping vinyl chloride polymerizations. The short-stoppers are myrcene, allo-ocimene, ocimene, α-alkyl-α, β-unsaturated ketones, vinyl pyridines, conjugated diolefines, chloroprene, *cyclo*mono-olefins, styrene, and its derivatives, polyunsaturated monocarboxylic acids, unsaturated aldehydes, acrylonitrile, and methacrylonitrile.

U.S.P. 2,616,935 (22.9.47; 4.11.52). R. G. Boatright and J. Fetchin, assrs to Phillips Petroleum Co. The growth of "popcorn" polymer from butadiene, styrene, or methyl methacrylate is prevented by treating the interior of the equipment carrying the materials with nitric acid of at least 70 wt % conen at 40° to 125° F.

U.S.P. 2,618,626 (Netherlands 27.12.49; 18.11.52). C. P. van Dijk and F. J. F. van der Plas, assrs to Shell Development Co. Olefinically unsaturated compounds are polymerized by introducing drops of the monomer into a liq aq medium maintained at the polymerization temp and containing a water-sol radical-yielding polymerization cat, an emulsifier, and dispersed polymer, maintaining a rate of drop introduction, such that the major part of the monomer passes through the aq medium unchanged and collecting the monomer drops which have so passed in a layer of monomer above the aq medium.

U.S.P. 2,619,512 (11.1.49; 25.11.52). W. K. Meerbott, assr to Shell Development Co. Propylene is polymerized in the presence of a phosphoric acid impregnated, ceramically bonded, porous aggregate having a P_2O_5 content of 35 to 70%. The activity of the cat is maintained by direct addition of liq phosphoric acid.

J. M. S.

Ger.P. 858,394, 16.10.52. M. Pier and W. von Füner, assrs to Bad. Anilin- & Soda-Fabr. Process for polymerizing olefins to hydrocarbon oils.

BrennstChemie, 1952, **33** (21–22). R. T.

Alkylation

1190. Producing mono-alkylated benzenes. P. W. Sherwood. *Petrol. Refin.*, Jan. 1953, **32** (1), 97–102.—The alkylation of benzene has become an important reaction in the production of styrene, phenol, and detergents.

Ethylation is carried out by liq and vapour phase processes which are discussed in detail.

Cumine was first produced as a high octane component for aviation gasolines, but now serves as an intermediate in the manufacture of phenol. The vapour and liq phase processes for its synthesis are described.

The alkylation of benzene to produce dodecyl and keryl benzene, for the production of synthetic detergents, employs a narrow kerosine cut as the alkylating agent, instead of a pure compound. A. R. H.

1191. Patents. U.S.P. 2,616,931 (30.6.50; 4.11.52). R. H. Rosenwald, assr to Universal Oil Products Co. *p*-Methoxyphenol is alkylated with *tert*-butyl alcohol below 175° C to give high yields of 2-*tert*-butyl-4-methoxyphenol.

U.S.P. 2,617,839 (14.8.50; 11.11.52). F. J. Moore, H. V. Hess, and R. K. Gould, assrs to Texas Co. A mixture of ethylene (I), propylene (II), and paraffinic gases is passed through a fluidized solid phosphoric acid or silica–alumina cat at a temp at which (I) and (II) are absorbed on the cat as ethyl and propyl esters but below the polymerization temp of (I) and (II). The cat carrying the esters is then fluidized with benzene vapours at a temp sufficient to decompose the propyl esters and alkylate the benzene with the resultant (II) but insufficient to decompose the ethyl esters. The ethyl esters are subsequently decomposed at a higher temp to recover (I).

U.S.P. 2,618,534 (15.4.50; 18.11.52). A. V. Mrstik, assr to Sinclair Refining Co. Apparatus for the alkylation of a tertiary paraffin with an olefin in the presence of sulphuric acid. The apparatus is designed to avoid side reactions between fresh olefins and acid–olefin complexes.

U.S.P. 2,618,669 (15.4.50; 18.11.52). A. V. Mrstik, assr to Sinclair Refining Co. 2-stage process for the alkylation of a tertiary paraffin with an olefin in presence of sulphuric acid. J. M. S.

Isomerization

1192. Isomerization of saturated hydrocarbons in presence of hydrogenation—cracking catalysts. F. G. Ciapetta and J. B. Hunter. *Industr. Engng Chem.* (*Industr.*), **1953, 45,** 147–65.—A general class of complex cat, consisting of hydrogenation–dehydrogenation cat in combination with silica–alumina cracking cat, has been found to be very active and highly selective for the isomerization of alkane and *cyclo*alkane hydrocarbons in the presence of H_2. These cat are active at temp of 250° to 450° C and hydrogen pressures of 7·1 to 48·5 atm. Isomerization cat have been prepared containing metals, metallic oxides, and metal salts.

Isomerization of 4 *n*-alkanes, 7 *iso*alkanes, and 4 *cyclo*alkanes, as well as the hydroisomerization of 2 alkenes has been investigated in the presence of a standard nickel (5% **wt**)–silica–alumina cat. Ease of isomerization of alkane hydrocarbons increases with increase in the number of carbon atoms and the presence of a tertiary hydrogen atom in the mol.

Activity and selectivity of the nickel–silica–alumina cat, for isomerization of *n*-hexane, depend on the Ni concentration, temp of cat activation, and the acidity. Experimental data indicate that the isomerization activity of this cat is due to a combination of the nickel with the hydrous aluminium silicate. The observed hydrogenation–dehydrogenation activity of the cat suggests that the isomerization of saturated hydrocarbons involves the initial formation of an alkene, or potential alkene, which re-arranges via a carbonium ion mechanism. (Authors' Abstract.) E. J. C.

1193. Patents. U.S.P. 2,616,934 (29.12.48; 4.11.52). H. Pines and B. Kvetinskas, assrs to Universal Oil Products Co. A hydrocarbon conversion process in which olefins are reacted at 225° to 500° C and at 15 to 200 atm in the presence of 5 to 70 mol % of sulphur dioxide.

U.S.P. 2,617,838 (2.10.47; 11.11.52). J. E. Nickels, assr to Koppers Co. The α-ethylnaphthalene in a mixture thereof with the β-isomer is isomerized to the β-isomer by vaporizing the mixture and passing it mixed with hydrogen halide over a magnesia–alumina cat. J. M. S.

Chemical and Physical Refining

1194. Mass transfer data for furfural extraction. L. Garwin and E. C. Barber. *Petrol. Refin.*, 1953, **32** (1), 144–8. (*Amer. Chem. Soc., Milwaukee, Apr.* 1952.)—Data are presented on furfural extraction of lub oil in a 2-in dia column packed to a height of 96 inch with ½-inch Raschig rings at 211° F. The H.E.T.S. was found to be 4·1 ft and independent of the solvent–oil ratio. A. R. H.

1195. Dehydration of natural gas and light hydrocarbon liquids. Pt IV. J. M. Campbell and L. Lawrence. *Petrol. Refin.*, 1953, **32** (1), 138–42.—Light hydrocarbon liq can be economically recovered by low temp separation with an absorption or compression refrigeration plant. Mechanical refrigeration ensures automatic and effective dehydration. Stock tank recoveries may be increased up to 30% over single stage separation by low temp separation. A. R. H.

1196. Patents. U.S.P. 2,613,175 (18.10.48; 7.10.52). L. H. Johnstone, L. A. Webber, and J. J. Costolow, assrs to Phillips Petroleum Co. The formation of benzene-insoluble self-propagating polymer in a butadiene fractionation zone is inhibited with an aq soln of sodium nitrite.

U.S.P. 2,614,119 (9.4.51; 14.10.52). W. T. Nichols, assr to Monsanto Chemical Co. Acrylonitrile polymerization is inhibited by small amounts of hydroquinone monobenzyl ether.

U.S.P. 2,614,653 (22.6.49; 21.10.52). J. E. Penick and E. V. Bergstrom, assrs to Socony-Vacuum Oil Co. Apparatus for separating a contact material of small particle size from a gas in which it is entrained.

U.S.P. 2,614,657 (19.6.51; 21.10.52). E. W. S. Nicholson, R. J. Fritz, and L. D. Etherington assrs to Standard Oil Development Co. A gaseous mixture is separated into less readily absorbed components, intermediate components, and more readily adsorbed components by contact, first with an adsorbent of reduced activity, and then with an adsorbent of high activity.

U.S.P. 2,614,658 (26.4.50; 21.10.52). J. L. Maker and C. O. Meyers, assrs to National Tank Co. Hydrocarbons are removed from gaseous streams by dividing the stream into a main stream and a stripping stream, removing hydrocarbons from the main stream with an adsorbent oil, heating the stripping stream, and using it to strip hydrocarbons from the enriched adsorbent oil, removing hydrocarbons from the enriched stripping stream, and recovering the hydrocarbons.

U.S.P. 2,614,659 (10.7.48; 21.10.52). W. W. Holland, assr to Gyro Process Co. Powdered cat are separated from a stream of hydrocarbon vapours by passing a stream containing both cat and hydrocarbons through a gravity separating zone and a centrifugal separator.

U.S.P. 2,614,971 (29.4.48; 21.10.52). W. P. Burton, assr to M.W. Kellogg Co. Aq soln of C_3 and higher alcohols are dehydrated by extraction with a relatively water-insoluble alcohol having at least 4 carbon atoms per mol and whose water-azeotrope will form two layers on condensation, to obtain an extract containing only a minor amount of water, dehydrating the extract, and recovering substantially anhydrous C_3 and higher alcohols from the dehydration step.

U.S.P. 2,615,028 (25.7.50; 21.10.52). S. C. Samuels, assr to Phillips Petroleum Co. Furfural is inhibited against its condensation by adding to it 0·01 to 0·4 wt % of dimethylformamide.

U.S.P. 2,615,787 (27.8.49; 28.10.52). H. E. Randlett, assr to Shell Development Co. Purification and separation of gaseous mixtures containing H_2S and similar acidic impurities.

U.S.P. 2,615,791 (25.11.49; 28.10.52). J. H. Raley, assr to Shell Development Co. Fractionation of hydrogen halide–olefin mixtures to isolate the hydrogen halide is improved by operating in the presence of one or more nitriles or *iso*nitriles.

U.S.P. 2,615,831 (8.12.49; 28.10.52). R. B. Bishop and W. J. Denton, assrs to Standard Oil Development Co. A mixture of hydrocarbons and sulphur-containing components is desulphurized by contacting the vapours of the mixture with finely divided nickel carbonyl at a temp between 400° and 900° F. D. A. R.

U.S.P. 2,616,830 (20.2.48; 4.11.52). T. W. Pratt, assr to M.W. Kellogg Co. Resinous colour bodies are removed from petrolatum by dissolving it in an alcohol solvent at a temp near the b.p. of the solvent, flowing the soln upwardly through a contacting zone down which an aq alkali soln flows and in which the soln is cooled, and recovering the petrolatum from the treated soln.

U.S.P. 2,616,831 (1.3.51; 4.11.52). R. H. Rosenwald, assr to Universal Oil Products Co. Hydrocarbon dist are sweetened by contacting them, in the presence of air, with a phenylenediamine, an inorganic alkaline material, and a solvent for the alkaline material, which solvent is an amine or amino alcohol.

U.S.P. 2,616,832 (14.10.49; 4.11.52). J. G. Browder and A. R. Smith, assrs to Standard Oil Development Co. Petroleum dist are sweetened by contacting them with a cat amount of an alkali metal hydroxide soln in the presence of less than 1·0 vol % of an aldehyde and a mild oxidizing agent.

U.S.P. 2,616,833 (1.3.51; 4.11.52). J. A. Chenicek and K. M. Brown, assrs to Universal Oil Products Co. A combined process for producing a sweet hydrocarbon dist of reduced gum formation which comprises treating the dist with an alkali metal hydroxide soln, regenerating the used soln, mixing a phenylenediamine with the treated dist, and finally treating the dist with the regenerated alkali metal hydroxide soln.

U.S.P. 2,616,834 (7.12.49; 4.11.52). K. E. Leutz, assr to Sun Oil Co. Sulphur compounds are removed from light mineral oil dist by contacting the dist in the liq phase with an aq suspension obtained by pptg iron hydroxide from an aq soln with a basic compound and acidifying until the pH of the suspension is between 4 and 7.

U.S.P. 2,616,835 (16.8.50; 4.11.52). W. H. Rupp, assr to Standard Oil Development Co. Cat cracked hydrocarbons boiling in the naphtha range are fractionally dist to form an overhead vapour fraction boiling up to *ca* 250° F, removing a second fraction boiling in the range *ca* 250° to 400° F, caustic washing the second fraction, combining the overhead vapour and the caustic washed fraction, at the same time condensing the vapour.

U.S.P. 2,617,719 (29.12.50; 11.11.52). C. R. Stewart, assr to Stanolind Oil and Gas Co. Porous earths are cleaned by forcing a liq solvent containing a dissolved gas under pressure into the earth and then rapidly reducing the pressure.

U.S.P. 2,617,815 (31.1.49; 11.11.52). J. J. Naugle. Crude wax is refined by heating it with a mixture of an acid-treated alkaline earth and an activated alkaline earth metal oxide at 200° to 300° F under a pressure of 10 to 25 psi.

U.S.P. 2,617,833 (3.10.50; 11.11.52). V. A. Kalichevsky and H. L. Sandlin, assrs to Socony-Vacuum Oil Co. Petroleum fractions containing phenols and mercaptans are contacted with an aq alkali metal hydroxide soln and the aq soln separated. The latter is mixed with a cat amount of a hypochlorite and then contacted with free oxygen to oxidize the mercaptans. The insoluble sulphur compounds formed are separated and the phenols isolated from the residual aq soln by acidification.

U.S.P. 2,618,586 (3.11.50; 18.11.52). F. J. Hendel, assr to Wigton-Abbott Corpn. Petroleum products are desulphurized by contacting them in the liquid phase with an oxide of nickel, tungsten, molybdenum, or manganese, or a mixture thereof. The sulphur compounds are adsorbed on the oxides without forming metal sulphides.

U.S.P. 2,618,644 (4.11.48; 18.11.52). A. E. Bailey, assr to Girdler Corpn. Oils are bleached by passing them through partially spent adsorbent, subsequently treating with adsorbent dispersed in the oil, separating the adsorbent, and using it in the first treatment.

U.S.P. 2,619,497 (6.5.48; 25.11.52). W. G. Hockberger, assr to Standard Oil Development Co. High boiling alcohols present in a predominantly hydrocarbon mixture are separated therefrom by adsorption on activated alumina. The alcohols are removed from the alumina by means of low boiling alcohol.

U.S.P. 2,619,501 (10.4.50; 25.11.52). G. C. Ray, assr to Phillips Petroleum Co. Decomposition of adducts of urea or thiourea with hydrocarbons, alcohols, or amines in a heated carrier gas. J. M. S.

Ger.P. 858,541, 24.10.52. R. Heinrich, assr to Metallges. A.G. Electrical purification of gases, *e.g.*, those containing weak-conducting, suspended particles.

Ger.P. 858,999, 16.10.52. P. Stoller, assr to F. G. Collin A.G. Process for recovering sulphur from coal dist gases, *e.g.*, coke plant gases by way of ammonium polysulphides.

BrennstChemie, 1952, **33** (21–22). R. T.

Special Processes

1197. Sulphur via the belt line. D. P. Thornton. *Petrol. Process.*, 1953, **8** (3), 389–91; *Petrol. Refin.*, 1953, **32** (2), 95–6.—The only substantial petrochemical operation in Mexico is the recovery of 120 tons/day of sulphur, which is carried out in conjunction with natural sweetening operations and crude stabilizing facilities.

The sulphur recovery process involves the basic Claus reaction. The cat convertors in use on the recovery unit employ bauxite as the conventional cat, with the reduction of the natural gas to elemental sulphur 90% complete.

A novel method of converting the molten sulphur to an easily handled flake form is used, the molten sulphur being deposited on an endless stainless steel belt, 320 ft long, running in contact with water in a cooling trough. At the " end " of the belt the solid sulphur is flaked off. J. W. H.

1198. Synthesis of methane. M. M. Gilkeson, R. R. White, and C. M. Sliepcevick. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 460–7.—Increasing use of methane has prompted an investigation into its synthesis from carbon monoxide on the grounds that natural sources may prove insufficient.

Apparatus and procedure described for reacting H_2 and CO in a SS tube, the walls of which acted as the cat. Results indicate that the process is feasible. E. J. C.

1199. Products of hydrogenation of carbon monoxide. D. G. Cain, A. W. Weitkamp, and N. J. Bourman. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 359–62.—Main oil-sol oxygenated compounds obtained by hydrogenation of CO were the higher aliphatic acids alcohols, and carbonyl compounds. E. J. C.

1200. Products of hydrogenation of carbon monoxide. A. W. Wietkamp and C. G. Frye. *Industr. Engag Chem.* (*Industr.*), 1953, **45**, 363–7.—Relation between product composition and reaction mechanism is discussed. E. J. C.

1201. Products of hydrogenation of carbon monoxide. W. E. Cady, P. J. Launer, and A. W. Weitkamp. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 350–3.—Aromatic compounds were analysed by various methods. Yield was about 6% of total hydrocarbons formed. Concentration of aromatics in any carbon number fraction increased with increase of carbon number. Compounds identified included benzene, xylenes, and 9 carbon *iso*mers, dicyclic and tricyclic compounds. E. J. C.

1202. Products of hydrogenation of carbon monoxide. A. Steitz, Jr., and D. K. Barnes. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 353–8.—Water sol oxygenated compounds identified in the above products included principally straight-chain alcohols, acids, aldehydes, and ketones. Esters, cyclic ketones, and branched chain products were present in minor proportions. E. J. C.

1203. Processing refinery waste to ammonium sulphate. E. D. Fox. *Petrol. Refin.*, Nov. 1952, **31** (11), 123. (*Petroleum Mech. Eng. Conf., ASME, Kansas City, Mo., Sept.* 1952.)—Ammonia is introduced into sulphuric acid with the resultant formation of ammonium sulphate, which is separated by evaporative crystallization followed by drying. Acid sludge may be charged to the plant without the necessity of separating the acid from the oil, and ammonia from refinery waste streams containing hydrogen sulphide can be used. A 12-ton/day plant developed by General Petroleum Corpn is described in detail. 2500 lb of sulphate is produced per ton of acid, and the oil present in the sludge is recovered. A. R. H.

1204. The Hyperforming process. C. Berg. *Oil Gas J.*, 23.3.53, **51** (46), 286.—Operation of a continuous reforming and upgrading process on low octane gasoline stocks is described. Tables show inspection data of feed and products. G. A. C.

1205. The OXO process in the U.S. for petrochemicals from olefins. P. W. Sherwood. *Petrol. Process.*, 1953, **8** (2), 241–8.—Since 1946, the OXO process, involving the addition of a carbonyl group and a hydrogen atom to a double bond, has been the subject of intensive industrial research. The reaction takes place with many olefins ranging from ethylene to di-*iso*butylene, from *cyclo*hexane to pinene, and yields in excess of 90% have been known. Unfortunately, it is not yet possible to effect the reaction with aromatics.

It has been shown that the OXO reaction leads to a complex mixture of isomeric aldehydes and primary alcohols; a number of side reactions also occur, but by careful choice of operating conditions they can be reduced to a minimum. In all commercial instances the reaction is carried out in the liq phase, with an activated form of cobalt as cat. In German practice the cat has a composition of 30% cobalt, 2% thoria, 2% magnesia, and 66% kieselguhr. The concentration of the cat in the reaction slurry varies from 0·04 to 0·05% cobalt (based on wt of olefin) where cobalt carbonyl is added as such, to 3% by wt for the use of the above cobalt cat.

OXO reaction temp are in the range 120° to 145° C with pressures in the region of 100 to 250 atm. Operation at low temp has the advantage of permitting reduction in system pressure.

Comparisons are made of the slurry type processes and the fixed bed processes. The markets available for the many OXO-synthesized chemical are also discussed.

J. W. H.

1206. The Wulff process for acetylene from hydrocarbons. M. J. P. Bogart, G. R. Schiller, and C. J. Coberly. *Petrol. Process.*, 1953, **8** (3), 377–83.—Acetylene has become one of the new major raw materials and building blocks for the manufacture of chemicals and synthetic products. The petrochemical industry has improved the processes available for the production of acetylene from hydrocarbon charging stocks. These processes, the Wulff process being one of the major ones, have successfully challenged the traditional carbide method of acetylene manufacture. They all yield a cracked gas containing acetylene diluted with various other reaction products. The acetylene is separated and purified from the cracked gas in each of the known methods.

The Wulff process has been in operation in the U.S. for over 2 years. The high temp required for the hydrocarbon conversion step is achieved by the use of a regenerative technique, giving a high degree of thermal economy. These regenerative furnaces operate alternately on heating and cracking operations. Short residence time of the hydrocarbon feed favours high yields of acetylene, which undergoes rapid decomposition in the temp range required for its formation. This time may be reduced in the reaction section of the furnace to approx 0·03 sec by operating under vac (7 to 10 psia).

The economic data of the Wulff process are presented together with tables of material balances for acetylene production from natural gas, ethane, and propane.

J. W. H.

1207. New process for ethylene oxide by direct oxidation. T. E. Corrigan. *Petrol. Refin.*, 1953, **32** (2), 87–9; *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 234–8.—A mixture of air and ethylene under pressure is passed through a series of parallel tubes containing a fluidized silver cat at 400° to 600° F. Ethylene oxide in the product is absorbed in water and recovered by steam stripping. Overall yields of 55 to 65% based on ethylene are obtained. This is lower than by chlorohydrin process, but no additional raw materials are needed for direct oxidation. R. D. S.

1208. Patents. U.S.P. 2,613,145 (30.12.48; 7.10.52). C. L. Crawford, assr to Gulf Research and Development Co. Apparatus for producing synthesis gas.

U.S.P. 2,613,173 (30.4.47; 7.10.52). O. G. Kaasa, assr to Sinclair Refining Co. Process for the fluid-cat conversion of hydrocarbons and the stripping of the fouled cat particles with steam.

U.S.P. 2,613,187 (14.6.49; 7.10.52). J. M. Marity, assr to Universal Oil Products Co. Phosphoric acid, siliceous adsorbent, and an alkyl orthosilicate or a siloxane are mixed to form a composite which is calcined to give a cat.

U.S.P. 2,613,188 (14.6.49; 7.10.52). J. M. Marity, assr to Universal Oil Products Co. Phosphoric acid, a siliceous adsorbent, and a halogen-containing silicon compound are mixed to form a composite which is calcined to give a cat.

U.S.P. 2,613,233 (G.B. 5.2.48; 7.10.52). D. P. Young, assr to Distillers Co. Monoolefinic compounds are hydroxylated by forming a soln of the olefinic compound, aq hydrogen peroxide, and a tungsten or molybdenum oxide, and heating in the presence of sulphuric acid at 70° to 100° C.

U.S.P. 2,613,227 (23.5.50; 7.10.52). G. G. Joris, assr to Allied Chemical and Dye Corpn. Cumene is contacted with solid calcium carbonate during liq phase oxidn by elemental oxygen to yield cumene hydroperoxide.

U.S.P. 2,613,228 (2.6.50; 7.10.52). R. P. Ruh, assr to Dow Chemical Co. Production of unsaturated fluorine-containing alicyclic ethers.

U.S.P. 2,613,832 (8.8.47; 14.10.52). H. J. Ogorzaly and W. A. Rex, assrs to Standard Oil Development Co. A method of feeding coarsely subdivided solids from a zone of relatively low pressure to a zone of relatively high pressure.

U.S.P. 2,614,114 (26.6.48; 14.10.52). R. W. Krebs, assr to Standard Oil Development Co. In a hydrocarbon synthesis process in which a fluidized bed of powdered

iron cat in a synthesis reaction zone is contacted with feed gas containing CO and H_2, cat activity is maintained by establishing an upper cat-oxidizing zone and a lower cat-reducing zone in the synthesis reaction zone.

U.S.P. 2,614,125 (10.1.49; 14.10.52). K. D. Detling and T. Skei, assrs to Shell Development Co. In the continuous oxidn of propylene to acrolein by passing a gaseous mixture comprising propylene, oxygen, and an inert gas over a cuprous oxide cat, cat activity is prolonged by periodically passing over the cat only oxygen and an inert gas.

U.S.P. 2,615,035 (1.9.48; 21.10.52). L. C. Rubin, E. W. Riblett, and H. G. McGrath, assrs to M.W. Kellogg Co. A process for hydrogenating carbon monoxide to produce normally liq hydrocarbons is carried out between 440° and 500° F and at 45 psi, and a conversion of carbon monoxide of at least 50% per pass and maintaining a space velocity related to pressure and temp by a given graph.

U.S.P. 2,615,090 (17.7.48; 28.10.52). H. Z. Martin, assr to Standard Oil Development Co. Removal of carbon dioxide from hydrocarbon synthesis tail gas.

U.S.P. 2,615,910 (29.10.48; 28.11.52). H. E. Cier, assr to Standard Oil Development Co. Hydrocarbons and oxygenated organic compounds are produced from CO and H_2 with an iron-type cat at a temp of 650° to 750° F and subsequently at a temp of 50° to 200° F.

U.S.P. 2,615,921 (7.11.49; 28.10.52). C. F. Dougherty and C. C. Chapman, assrs to Phillips Petroleum Co. A process for oxidizing C_4–C_{20} *cyclo*-aliphatic hydrocarbons with free oxygen in which a portion of the hydrocarbon rotates as a liq mass in a smooth-walled mixing zone. D. A. R.

U.S.P. 2,616,794 (24.12.50; 4.11.52). J. C. Krejci, assr to Phillips Petroleum Co. Process for producing carbon black from hydrocarbons in the gas phase.

U.S.P. 2,616,795 (15.9.50; 4.11.52). J. C. Krejci, assr to Phillips Petroleum Co. Process for producing carbon black from gas oil vapours free of normally gaseous hydrocarbons.

U.S.P. 2,616,837 (3.1.49; 4.11.52). J. C. Roediger, assr to Standard Oil Development Co. Air-blowing of bitumen is carried out in the presence of a methylpolysiloxane.

U.S.P. 2,616,897 (26.6.46; 4.11.52). H. Pines and B. Kvetinskas, assrs to Universal Oil Products Co. Alkenyl thiophenes are made by reacting a thiophene with a diolefin containing one tertiary double bond and one non-tertiary double bond.

U.S.P. 2,616,898 (8.12.48; 4.11.52). P. C. Keith, assr to M.W. Kellogg Co. Normally gaseous aliphatic hydrocarbons or aromatic hydrocarbons are oxidized in the vapour phase using fluidized copper oxide as the oxidizing agent. The reduced copper oxide is oxidized with air while in a fluidized condition and returned to the oxidation zone.

U.S.P. 2,616,914 (11.5.46; 4.11.52). E. W. Riblett, assr to Hydrocarbon Research Inc. In exothermic cat processes involving the passage of a gaseous reactant through a fluidized bed of cat, temp control of the bed is improved and uncontrolled exothermic reactions in the gaseous effluent are prevented by maintaining a finely divided inert solid in the bed of cat, the solid having a lower settling rate than the cat so that it accumulates at the top of the bed and is preferentially entrained in the effluent.

U.S.P. 2,616,915 (30.10.47; 4.11.52). C. W. Watson, assr to Texas Co. In the synthesis of hydrocarbons from hydrogen and carbon monoxide using a fluidized bed of iron particles, the disintegrated cat particles are separated and are built up into particles of a size suitable for the cat bed by means of a cementitious material and are returned to the cat bed.

U.S.P. 2,616,916 (6.12.50; 4.11.52). R. L. Heinrich, assr to Standard Oil Development Co. The viscosity of olefinic lub oil polymers is increased by oxidizing them at 300° to 600° F in the presence of diphenylthiourea.

U.S.P. 2,616,921 (30.11.50; 4.11.52). C. B. Linn, assr to Universal Oil Products Co. Long chain alkyltoluenes are oxidized with nitric acid to nitroalkylbenzoic acids, which are condensed with a polyalkylene glycol to form an ester.

U.S.P. 2,616,933 (26.7.49; 4.11.52). C. B. Linn, assr to Universal Oil Products Co. Alcohols are produced by reacting olefins with water in the presence of hydrogen fluoride.

U.S.P. 2,616,936 (12.4.49; 4.11.52). H. E. Mammen and G. L. Hervert, assrs to Universal Oil Products Co. Sulphonation by liq or solid sulphur trioxide is carried out by introducing the sulphur trioxide into the reaction zone entrained in a paraffinic hydrocarbon of 3 to 8 carbon atoms.

U.S.P. 2,617,273 (25.4.49; 11.11.52). R. A. Findlay, assr to Phillips Petroleum Co. Continuous fractional crystallization process.

U.S.P. 2,617,493 (15.4.46; 11.11.52). J. P. Jones, assr to Phillips Petroleum Co. Separating gaseous paraffin hydrocarbons from nitrogen by diffusion through a non-porous membrane, *e.g.*, a rubber membrane, in a plurality of stages.

U.S.P. 2,617,599 (Netherlands 21.3.47; 11.11.52). H. F. Dammers, assr to Shell Development Co. Finely powdered surface-active salts of sulphonic acids or sulphate esters are obtained by spray-drying an aq soln of the salt, compressing the dry powder, mixing it with a further dry powder resistant to grinding, and grinding the mixture.

U.S.P. 2,617,714 (17.9.51; 11.11.52). P. M. Arnold, assr to Phillips Petroleum Co. Carbon black is produced by spraying an aq emulsion of a heavy refined hydrocarbon as droplets into a carbon black furnace. The water flashes to steam and further subdivides the droplets.

U.S.P. 2,617,774 (Germany 13.9.49; 11.11.52). W. Rottig, H. W. Gross, P. Royen, and K. Schenk, assrs to Ruhrchemie A.G. and Lurgi Gesselschaft Fuer Waermetechnik m.b.H. Cat for Fischer–Tropsch process is made by pptg iron hydroxide from an iron nitrate soln at a pH of 6·8 to 7·2, separating and washing the ppt, adding an alkali metal water-glass soln to an aq slurry of the ppt, adding nitric acid, filtering, drying the filter residue, moulding into particles, and reducing the particles with a reducing gas at 200° to 350° C.

U.S.P. 2,617,816 (11.10.50; 11.11.52). J. H. Crowell and H. E. Benson, assrs to U.S.A. (Secretary of the Interior). In the Fischer–Tropsch process in which the cat is immersed in a cooling liq (1) for removing the heat of reaction, a stream of (1) is withdrawn from the reaction zone to a contacting zone in which it is passed, countercurrently to a dry mixture of hydrogen and carbon monoxide. (1) is then returned to the reaction zone.

U.S.P. 2,617,834 (21.2.50; 11.11.52). J. E. Woodbridge, assr to Atlantic Refining Co. Primary and second olefins are converted into alcohols by contact with an aq soln of BF_3 and liquefied SO_2 at $+25°$ to $-50°$ C.

U.S.P. 2,618,533 (22.7.48; 18.11.52). J. L. Bills and A. C. McKinnis, assrs to Union Oil Co. of California. Carbon black is produced by passing a gaseous hydrocarbon and oxygen through a porous wall and burning the mixture in a closed space while passing oxygen into the flame countercurrently to the burning mixture.

U.S.P. 2,618,542 (27.2.48; 18.11.52). C. Alexander and G. H. Palmer, assrs to M.W. Kellogg Co. A mixture of hydrogen and carbon monoxide is made by reacting a hydrocarbon with steam in presence of a finely divided contact material to produce hydrogen and carbon monoxide and to deposit carbon on the contact material, passing the contact material to a second zone where the carbon is burnt off to carbon monoxide, and returning the contact material to the first zone. The two product gases are mixed.

U.S.P. 2,618,543 (19.8.49; 18.11.52). B. J. Mayland, assr to Phillips Petroleum Co. A mixture of hydrogen and carbon monoxide is made by partially oxidizing a light hydrocarbon with oxygen to produce hydrogen, carbon monoxide, and carbon, quenching to 1100° to 1200° F and simultaneously producing more hydrogen and carbon monoxide by introducing an aq slurry of carbon into the partial oxidation products.

U.S.P. 2,618,611 (12.9.49; 18.11.52). B. J. Mayland, assr to Phillips Petroleum Co. The ratio of hydrogen to carbon monoxide in synthesis gas is increased by introducing 0·01 to 0·25 mol of oxygen per mol of carbon monoxide and reacting the mixture over a water-gas shift cat at 800° to 1500° F.

U.S.P. 2,618,662 (4.1.49; 18.11.52). W. M. Hutchinson, assr to Phillips Petroleum Co. Production of naphthene hydroperoxides by controlled oxidation of naphthenes at 135° to 165° C and under a pressure of 150 to 4000 psi with oxygen, dist off a portion of the unreacted hydrocarbons, treating the residue with 50 to 60% sulphuric acid at −15° to −5° C, separating the acid phase and treating the hydroperoxide with an aq slurry of an alkali metal carbonate.

U.S.P. 2,618,664–6 (29.7.50; 81.11.52). H. V. Hess and G. B. Arnold, assrs to Texas Co. These patents are concerned with processes for isolating phenols from mixtures containing them. Complex formation of the phenols with hexamethylene tetramine, alkylene diamines, and polyalkylene diamines is used.

U.S.P. 2,618,667 (31.10.46; 18.11.52). G. H. Hanson, assr to Phillips Petroleum Co. Cat dehydrogenation of hydrocarbons followed by solvent extraction to extract the dehydrogenated product.

U.S.P. 2,619,410 (Switzerland 15.6.48; 25.11.52). A. E. Fross, assr to International Carbon-Black Corpn. Apparatus for the explosive conversion of hydrocarbon gases to carbon black, comprising elongated water-cooled pipes with finned tubular cooling elements in the pipes.

U.S.P. 2,619,415 (15.8.46; 25.11.52). C. E. Hemminger, assr to Standard Oil Development Co. Conversion of fluidized beds of carbonaceous materials to fuel gas in two stages, the second stage being at a higher temp than the first. Fresh solids are fed to the first stage and the solids from the first stage are fed to the second, the temp of which is maintained by a tubular heater containing burning gases.

U.S.P. 2,619,449 (30.12.48; 25.11.52). S. B. Sweetser, assr to Standard Oil Development Co. High calorific fuel gas is made by passing steam through a fluidized bed of coal or coke, passing the solids from said bed to a second fluidized bed through which hydrocarbons are passed and cracked therein, passing the solids from the second bed into the water gas generation zone above the fluidized bed therein so that adsorbed hydrocarbons are stripped therefrom and cracked, and withdrawing a stream of gas comprising cracked hydrocarbons, carbon monoxide, and hydrogen.

U.S.P. 2,619,511 (Germany, 2.6.49; 25.11 52). R. Conrad. Unsaturated hydrocarbons are made by reacting an olefin with a aliphatic ether at 200° to 500° C in the presence of cat promoting the splitting off of water. J. M. S.

Ger.P. 857,799, 9.10.52. H. G. Pistor and K. Bossert, assrs to Bad. Anilin- & Soda-Fabr. Method for producing methyl alcohol.

Ger.P. 860,048, 30.10.52. H. Brendlein, assr to Dt. Gold- & Silber-Scheideanstalt. Process and plant for methanol production.

Ger.P. 857,800, 9.10.52. J. Giesen, assr to Bad. Anilin- & Soda-Fabr. Method for producing monovalent alcohols.

Ger.P. 859,463, 20.12.42. W. Reppe, K. Klager, and O. Schlichtling, assrs to Bad. Anilin- & Soda-Fabr. Process for obtaining high-mol unsaturated hydrocarbons.

Ger.P. 859,605, 23.10.52. W. Jahnentz, W. Reich, and K. Weichert, assrs to Chemische Werke Hüls G.m.b.H. Process for purifying cracked gases. (Addn. to Pat. 849,738.)

BrennstChemie, 1952, **33** (21–22). R. T.

Metering and Control

1209. Automatic process controllers. A. Pollard. *Petroleum, Lond.*, Mar. 1953, **16** (3), 63–7.—The advantages of pneumatic and electrical control instruments are discussed, and 4 post-war designs by British manufacturers are described in some detail; 3 are pneumatic and the 4th electrical. (*Cf.* Abs. No. 2892, 1952.)

R. E. P.

1210. Monitoring of process variables. A. F. Sperry. *Oil Gas J.*, 16.3.53, **51** (45), 96.—Process monitoring, graphic panel boards, annunciator and automatic scanning systems, and automatic scanning records are dealt with in this discussion on better monitoring of process variables. G. A. C.

1211. Statistical quality control-applications and limitations. L. J. McGovern. *Petrol Refin.*, 1953, **32** (2), 121–4.—Describes how control charts can be used for repetitive work, such as packaging and routine testing, and suggests how statistics may be applied to quality control in processing units in the future. R. D. S.

1212. Instrumentation of " packaged " gasoline plants. T. D. Tabbert. *Oil Gas J.*, 16.3.53, **51** (45), 100.—2 entirely different processes are studied, and the variety of control problems they present are discussed. Flow sheets for typical refrigeration-type gasoline plant extraction unit, automatic fractionation, and packaged adsorption plants are given. G. A. C.

1213. Platte pipe line communications and control systems. M. L. Long. *Oil Gas J.*, 6.4.53, **51** (48), 91.—Micro-wave system includes 44 stations for the 932-mile long line controlled by headquarters in Kansas City except for V.H.F. circuits, which are controlled from 3 section stations. 29 of the 44 stations are unattended. G. A. C.

1214. Check these uses for radio-isotopes. J. Kohl. *Petrol. Refin.*, Nov. 1952, **31** (11), 117–19. (*Ann. Tech mtg of Amer. Inst. Chem. Engrs., Houston*, 1952.)—The uses of radio-isotopes in the chemical industry, including mixing studies, concentration measurement, and flow, are discussed, and details of the cost of suitable isotopes presented. A. R. H.

1215. Patents. U.S.P. 2,617,304 (20.3.46; 11.11.52). G. E. Conover, assr to Socony-Vacuum Oil Co. Pressure measuring instrument.

U.S.P. 2,617,305 (16.12.47; 11.11.52). C. G. Dahm and D. H. Clewell, assrs to Socony-Vacuum Oil Co. Apparatus for avoiding the alteration of the reading of a barometer due to flow of air thereto at a temp different from that of the barometer.

U.S.P. 2,617,716 (17.1.50; 11.11.52). R. E. Hartline, assr to Stanolind Oil and Gas Co. Combustible gas detectors.

U.S.P. 2,618,974 (1.3.51; 25.11.52). G. R. Gilbert, assr to Standard Oil Development Co. Fluid flow measuring apparatus comprising a vertical non-magnetic gauge tube, a non-magnetic float in the gauge tube, and a magnetic weight in the gauge tube above the float. The weight and float have mating surfaces so that the weight may be placed on, or removed from, the float by an external magnet.

U.S.P. 2,618,978 (23.1.51; 25.11.52). D. Ragland, assr to Standard Oil Development Co. Pressure gauge attaching device for portable service. J. M. S.

Ger.P. 858,996, 16.10.52. C. Miedbrodt, assr to Bamag-Meguin A.G. Reverse and stop device for installations producing hydrogen by iron–steam or similar regenerative process.

BrennstChemie, 1952, **33** (21–22). R. T.

PRODUCTS

Chemistry and Physics

1216. Phase behaviour of the H_2–C_3H_8 system. W. L. Burriss, N. T. Hsu, H. H. Reamer, and B. H. Sage. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 210–13.—Phase equilibrium data reported for above system over the range 0 to 8000 psi. E. J. C.

1217. Liquid–vapour equilibrium relations in binary systems. W. B. Kay and C. M. Rambosek. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 221–6.—Apparatus and experimental procedure reported for investigating the system propane–hydrogen sulphide over the range 32° to 210° F and 200 to 120 psi. E. J. C.

1218. Vapour–liquid equilibria for binary hydrocarbon water systems. R. Kobayashi and D. L. Katz. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 440–51.—First part of the paper deals with apparatus and procedure adopted for determining data on the propane–water system between 40° and 320° F and 100 and 3000 psi. The second part

is a correlation of published data on binary systems of hydrocarbons—H_2O, as well as H_2 and N_2–H_2O systems. E. J. C.

1219. Ternary solubility data for systems involving 1-propanol and water. J. F. McCarts, J. H. Jones, and W. H. Hopson. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 454–6.—Data reported on systems of above two compounds with *n*-butanol, benzene, *n*-hexane, and heptane at 100° F. E. J. C.

1220. Enthalpy of petroleum fractions. C. R. Bauer and J. F. Middleton. *Petrol. Refin.*, Jan. 1953, **32** (1), 111–13.—An enthalpy chart is presented and recent experimental data have been used in its development. The characterization factor and API gravity ranges are extended. Liquid enthalpies read from the chart show an average deviation of 3%, except within 50° F of the pseudo-critical temperature, where deviations may exceed 10%. Vapour enthalpies at one atm reproduce the experimental data with an average deviation of ±10 B.Th.U/lb. A. R. H.

1221. The solubility of gases in lubricating oils and fuels. R. R. Baldwin and S. G. Daniel. *J. Inst. Petrol.*, 1953, **39**, 105–23.—A method is described for determining the solubilities of gases in oils and fuels to an accuracy of 1%. This method is particularly applicable to viscous liquids. For a series of solvent extracted oils derived from the same crude it was found that the gas solubility decreases as the mol. wt. increases, and these results are discussed together with those obtained from a number of fuels. A. R. W. B.

1222. A preliminary study of the rheological properties of residual fuel oils in relation to their composition. G. C. Ackroyd and C. M. Cawley. *J. Inst. Petrol.*, 1953, **39**, 82–104.—One of 3 wax-containing straight-run atm residues from Middle East crudes under investigation has been analysed by extraction methods, the details of which are given, into asphaltenes, wax, and oil fractions. The rheological properties of these oils at different stages of the extraction have been studied. The fluidity of such oils is influenced by their thermal history, the sensitivity to treatment at different temp being greatly increased when asphaltenes and resins are present. It was found in an oil in a condition of high fluidity that the effect of asphaltenes and resins is to reduce the rigidity of the system, but in an oil of low fluidity this effect is not nearly so marked. A. R. W. B.

1223. Strip photographs of advancing flames in extended transverse electric fields. U. Neubert. *BrennstChemie*, 1952, **33** (21–22), 370–5.—A brief review of previous work on flame behaviour is given. The apparatus described and illustrated is used to observe the advance of propane flames in long tubes, through a strong inhomogeneous elec field. The flame is observed to advance with greatly increased velocity along to the cathode plate. From observations of instantaneous strip photographs, it appears that an essentially smaller density gradient, in its hydrodynamic discontinuity surface, is to be attributed to the flame travelling in the elec field, on account of lack of more powerful contours and contrasts. It has also less energy than the normal flame surface. R. T.

1224. The viscosity, thermal conductivity and specific heat of carbon dioxide at elevated pressures and temperatures. I. Granet and P. Kass. *Petrol. Refin.*, Nov. 1952, **31** (11), 137–8.—Data from the literature up to 2000 psi and 1500° F are presented graphically. A. R. H.

Analysis and Testing

1225. Determination of oil content of paraffin and microcrystalline waxes. J. E. Blaylock. *Petrol. Refin.*, Nov. 1952, **31** (11), 133.—An apparatus is described for the determination of oil content by extraction with M.E.K. The repeatability and reproducibility compares favourably with ASTM requirements, and a large number of samples can be run concurrently. A. R. H.

1226. Dielectrometric investigations. P. Forjaz. *Chim. Analyt.*, 1953, **35**, 53–6.—Use of dielectric const as a means of examining fatty oil-base pharmaceutical products is described, and application of this characteristic to analysis of other fatty and also mineral oils is briefly discussed. Values of dielectric const for a number of pet products and lub oils are given. V. B.

1227. Patents. U.S.P. 2,619,408 (19.4.50; 25.11.52). A. C. Mengel. Method of determining the rate at which sludge will form in a lub oil under service conditions in a diesel engine which involves bubbling air through the heated lub oil in the presence of a metal cat, the area of which bears a predetermined ratio to the area of the same metal which will be exposed to the oil under said service conditions. During the test the sample is heated by intermittently immersing in it a heated member of cat inert material. J. M. S.

Ger.P. 858,027, 9.10.52. Drägerwerk H. & B. Dräger. Process for oxygen estimation.

Ger.P. 858,777, 16.10.52. E. Ebbinghaus, assr to Bad. Anilin- & Soda-Fabr. Apparatus for gas analysis by heat conductivity measurement.

Ger.P. 858,028, 9.10.52. E. Turowski, assr to Auerges. A.G. Magnetic process for analysis of materials, *e.g.*, gas mixtures.

Ger.P. 858,029, 9.10.52. E. Turowski and F. Klauer, assrs to Auerges. A.G. Magnetic process for analysis of materials, *e.g.*, gas mixtures.

Ger.P. 858,151, 9.10.52. E. Turowski, assr to Auerges. A.G. Layout for magnetic analysis of materials, *e.g.*, gas mixtures.

Ger.P. 858,152, 9.10.52. E. Turowski and F. Klauer, assrs to Auerges. A.G. Magnetic process for analysis of materials, *e.g.*, gas mixtures.

Ger.P. 858,778, 16.10.52. E. Turowski, assr to Auerges. A.G. Magnetic process for analysis of materials, *e.g.*, gas mixtures.

Ger.P. 858,031, 9.10.52. F. Schmidt, assr to Maschinenfabr. Augsburg–Nürnberg A.G. Device for measuring visc of flowing liq.

Ger.P. 858,037, 9.10.52. L. Sussmeyer. Sampling device.
BrennstChemie, 1952, **33** (21–2). R. T.

Gas

1228. Dehydration of natural gas and light hydrocarbon oils. Pt. V. J. M. Campbell and L. Laurence. *Petrol. Refin.*, 1953, **32** (2), 131–4.—Discusses the use of hydrate inhibitors (methanol or glycol) in expansion refrigeration. Choice of inhibitor and important process and equipment factors are considered. The lowering of the dew point of the exit gases by the use of an inhibitor is given graphically, and a rough estimate of the economics of the process is made. R. D. S.

Engine Fuels

1229. The burning of boiler oil in two- and four-stroke cycle diesel engines and the development of fuel injection equipment. A. G. Arnold. *Trans. Inst. Mar. Engrs*, Mar. 1953, **65** (3), 57.—Experience of the burning of boiler oil in 5 different types of marine diesel engines is described. Details of alterations made to the engines are given, and the effects of prolonged use of boiler oil on engine components are recorded and illustrated. Performance of vessels before and after conversion to boiler oil burning and indicator diagrams for diesel fuel and boiler oil operation are given. Economies resulting from the use of boiler oil are recorded. The development of the Archaouloff fuel system for m.v. *Alcinous* is described and the results given. Report of discussion is appended. 1 ref. T. T.

1230. Patents. U.S.P. 2,613,142 (11.5.48; 7.10.52). S. B. Wiezer. An alcohol fuel gel comprises 75% commercial alcohol having 1 to 3 carbon atoms gelled with 3 to 50% by weight, based on combustible liquid, of methyl cellulose.

U.S.P. 2,614,136 (6.7.49; 14.10.52). J. J. Kolfenbach and A. B. Small, assrs to Standard Oil Development Co. Normally gaseous olefins are polymerized to hydrocarbons boiling in the motor fuel boiling range by contact with a liquid cat consisting essentially of phosphorous pentoxide dissolved in a tri (C_{2-5} alkyl) phosphate.

U.S.P. 2,614,914 (4.6.46; 21.10.52). L. T. Ely, assr to Standard Oil Development Co. A hydrocarbon diesel fuel containing an ignition-promoting amount of a dialkyl sulphide having C_8–C_{31} tertiary alkyl radicals and from 4 to 8 sulphur atoms linking the tertiary alkyl radicals.

U.S.P. 2,614,966 (1.5.50; 21.10.52). B. M. Vanderbilt, assr to Standard Oil Development Co. The oxidation stability of petroleum oils is improved by treating the oil above 150° C with finely divided sodium and an ether or a ketone as an activator in specified quantities.

U.S.P. 2,614,967 (28.7.49; 21.10.52). B. M. Vanderbilt and A. H. Gleason, assrs to Standard Oil Development Co. Oxidation stability and engine cleanliness characteristics of a cracked gasoline are improved by agitating the gasoline with about 1% of sodium, potassium, or lithium and 5 to 25 molar % (based on the metal) of a secondary or tertiary alcohol of less than 7 carbon atoms, the temp being above 70° C, and separating the gasoline from the sediment.

U.S.P. 2,615,799 (3.4.48; 28.10.52). E. J. Martin, assr to Sinclair Refinery Co. A diesel fuel containing from 0·005 to 2% of a pour-point depressing polymerization product of α-methacrylic acid esters and lauryl alcohols and from 0·005 to 15% of an extraneous amorphous or crystalline hydrocarbon wax having a cetane value at least equal to that of the fuel when free of additives. D. A. R.

U.S.P. 2,618,538 (3.2.49; 18.11.52). A. R. Jones and A. E. Robertson, assrs to Standard Oil Development Co. Diesel fuel containing 0·5 to 2% of an organic peroxide and 5 to 50 lb of 2 : 4-dinitro-6-*cyclo*hexylphenol per 5000 gal.

U.S.P. 2,618,612 (1.6.50; 18.11.52). W. C. Howell, A. R. Jones, and J. O. Smith, assrs to Standard Oil Development Co. A lead fluid comprising tetraethyl lead and chloro- or bromo-amino-toluene or -xylene. J. M. S.

Ger.P. 860,485, 30.10.52. Bad. Anilin- & Soda-Fabr. Method for producing gasoline. (Addn. to Pat. 844,142.)

Ger.P. 857,998, 9.10.52. H. Tramm and H. Kolling, assrs to Ruhrchemie A.G. Method for producing high-grade gasolines.
BrennstChemie, 1952, **33** (21–2). R. T.

Gas Oil and Fuel Oil

1231. Methods of atomizing liquid fuel. J. R. Joyce. *J. Inst. Petrol.*, 1953, **39**, 57–71.—A general description is given of the main types of atomizing oil burners, and their operational features are commented on. Factors affecting the choice of atomizers and the desirable features to be looked for are reviewed. The main fuel property affecting quality of atomization is viscosity. Other physical factors involved and methods of testing atomization are mentioned. A. R. W. B.

1232. Patents. U.S.P. 2,616,488 (5.5.51; 4.11.52). G. F. Olsen, assr to California Portland Cement Co. Combination fuel oil and gas burner.

U.S.P. 2,616,492 (31.3.45; 4.11.52). J. Sontag. Fuel oil carburettor burner.

U.S.P. 2,616,493 (15.5.50; 4.11.52). H. K. Winters, assr to Ray Oil Burner Co. Flame control means for oil burners.

U.S.P. 2,618,536 (20.9.50; 18.11.52). J. V. Hunn, assr to Sherwin-Williams Co. Gel-type fuel comprising a liq hydrocarbon and 0·5 to 20 wt % of an alkoxy aluminium carboxylate.

U.S.P. 2,619,159 (28.9.49; 25.11.52). C. C. Young. Horizontally fired combination oil and gas burner unit. J. M. S.

Lubricants

1233. Progress in the art and science of lubrication. E. V. Paterson. *Petrol. Times*, 17.4.53, **57** (1453), 407.—This quarterly review deals with saving in fuel consumption from 5W oils, pre-dilution of aero-engine oil, synthetic lubricants, and lubrication of computing machines. G. A. C.

1234. Chemical addition agents for lubricating oils. W. D. Thomas. *Petrol. Refin.*, 1953, **32** (1), 103–6. (*Amer. Soc. Lub. Engrs.*)—Additives used in lub oils include pour point depressants, V.I. improvers, anti-oxidants, and detergents. Progress over the past 25 years in the field is discussed. A. R. H.

1235. Evaluating viscosity index improvers. E. J. Reeves. *Petrol. Refin.*, 1953, **32** (2), 139–41. (*Amer. Chem. Soc., Little Rock, Dec.* 1952.)—The V.I. and viscosities of blends of a particular V.I. improver and any lub oil base stock can be predicted from special blending charts described here. The charts must be prepared from data obtained from blends of several different stocks with the additive required. Predicted values for the blends are within 3% of true value. R. D. S.

1236. Effect of alkyl constitution on anti-oxidant properties of phenols. J. I. Wasson and W. M. Smith. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 197–200.—A number of alkyl substituted phenols were synthesized and added to a pet-base lub oil. Most effective anti-oxidants were those having *tert*-butyl groups in the 2 and 6 positions *ortho* to the hydroxyl group, and a normal alkyl group in the 4 position. Effectiveness also increased with increase of C atoms from 1 to 4 in the alkyl group in the 4 position.

2 : 6-Di-*tert*-butyl-4-cresol, one of the better anti-oxidants investigated, is already widely in use in pet products. E. J. C.

1237. Patents. U.S.P. 2,615,844 (14.11.49; 28.10.52). J. J. Giammaria, assr to Socony-Vacuum Oil Co. A mineral lub oil containing a minor proportion of a V.I. improver produced by copolymerizing maleic anhydride with an aliphatic vinyl compound in the presence of a thiophene and reacting the copolymer with aliphatic alcohols and amines.

U.S.P. 2,615,845 (2.8.48; 28.10.52). S. B. Lippincott and L. A. Mikeska, assrs to Standard Oil Development Co. A mineral lub oil containing as a V.I. improver and pour-point depressant, a minor proportion of a high mol. wt. copolymer formed by reacting maleic anhydride and a straight chain 1-olefin in the presence of a peroxide cat and then esterifying the copolymer with a mixture of alcohols in which lauryl alcohol predominates.

U.S.P. 2,613,182 (5.1.50; 7.10.52). L. W. Sproule and L. F. King, assrs to Standard Oil Development Co. A lub grease comprising a major proportion of a lub oil thickened with a minor proportion of a metal soap of 1 : 2-ketostearic acid.

U.S.P. 2,613,183 (19.8.49; 7.10.52). A. D. Kirshenbaum and J. M. Boyle, assrs to Standard Oil Development Co. An extreme pressure additive for lubricants is obtained by reacting a monocyclic terpene with a sulphur chloride to give an intermediate product which is finally reacted with phosphorous sulphide.

U.S.P. 2,613,184 (8.11.51; 7.10.52). W. E. Catlin. A lub oil containing a copolymer of an ester of an unsaturated acid and a *N*-hydrocarbon amide of an unsaturated acid.

U.S.P. 2,614,075 (28.5.49; 14.10.52). J. D. Bartleson, assr to Standard Oil Co. A lub oil additive consisting of the reaction product of a sulphurized-radical-free aliphatic amide and a phosphorous sulphide.

U.S.P. 2,614,076 (16.9.49; 14.10.52). R. J. Moore and W. Saarni, assrs to Shell Development Co. A grease comprising a lub oil base thickened with a lithium soap of a C_{10-24} hydroxy fatty acid and a second alkali metal soap of a C_{3-18} organic monocarboxylic acid which has a hydroxy-, keto-, amino-, nitro-, mercapto-, thio-, or sulpho-substituent.

U.S.P. 2,614,078 (10.12.49; 14.10.52). L. R. Churchill, assr to Tide Water Associated Oil Co. Lub compositions comprising a sulphurized fatty oil are decolorized by treatment with free oxygen and an oxidation cat.

U.S.P. 2,614,079 (18.7.49; 14.10.52). R. J. Moore, assr to Shell Development Co. A grease comprises a mineral lub oil thickened with an anisometric fibrous lithium soap having fine and coarse fibres in a ratio between 3 : 1 and 1 : 3.

U.S.P. 2,614,080 (22.7.50; 14.10.52). L. M. Welch, assr to Standard Oil Development Co. A lub composition comprising a major proportion of a waxy lub oil base and between 0·1 and 10·0% by weight of the total composition of an alkylated polystyrene of mol. wt. between 7000 and 20,000.

U.S.P. 2,614,985 (25.10.51; 21.10.52). D. L. Cook, assr to Shell Development Co. A lub composition comprising at least 90% of a mineral lub oil containing dispersed therein from 0·05 to 2% by weight of boric acid.

U.S.P. 2,614,986 (12.11.48; 21.10.52). A. Beerbower and A. J. Morway, assrs to Standard Oil Development Co. A solid grease comprising a mineral oil thickened with magnesium oxide or magnesium carbonate of bulk density less than 2 lb/gal in its normal finely divided dry condition.

U.S.P. 2,614,987 (7.12.50; 21.10.52). J. C. Dreher and C. F. Carter, assrs to California Research Corpn. A grease comprises a lub oil, a thickening agent, and minor amounts of a polyvalent metal dithiocarbonate and of dihydroxy anthraquinone.

U.S.P. 2,614,991 (30.3.50; 21.10.52). J. J. Wasson, assr to Standard Oil Development Co. An emulsifiable, soap-free steam cyl oil consisting essentially of about 87% by weight of a specified Mid-Continent lub oil, about 10% of a resinous, propane-precipitated Pennsylvania type paraffinic petroleum oil residue, and about 3% tallow.

U.S.P. 2,615,843 (31.8.51; 28.10.52). J. J. Giammaria, assr to Socony-Vacuum Oil Co. A mineral lub oil containing: (*a*) a minor amount of a basic metal sulphonate; and (*b*) a minor amount of an esterified copolymer formed by reacting a vinyl compound with maleic anhydride and esterifying with a normal primary saturated aliphatic alcohol or alcohols, the copolymer ester being stabilized against the action of the sulphonate to reduce its pour-point depressing effect, by reacting the copolymer ester with a primary amine. D. A. R.

U.S.P. 2,616,849 (11.5.49; 4.11.52). J. J. Giammaria, assr to Socony-Vacuum Oil Co. Lub oils contain a copolymer of maleic anhydride and a diester of itaconic acid or a metal salt of such copolymer, as V.I. improvers and pour point depressants.

U.S.P. 2,616,850 (22.11.49; 4.11.52). G. V. Browning, assr to Standard Oil Co. Greases are made by extracting the lub oil from a grease with a solvent, adding a different lub oil and evaporating the solvent.

U.S.P. 2,616,851 (29.4.47; 4.11.52). J. J. Giamaria, assr to Socony-Vacuum Oil Co. Lub oils contain a product made by reacting vinyl acetate with an α-, β-unsaturated di-carboxylic acid anhydride and esterifying the reaction product with a normal, saturated aliphatic alcohol having 12 to 18 carbon atoms.

U.S.P. 2,616,852 (21.6.47; 4.11.52). J. J. Giammaria, assr to Socony-Vacuum Oil Co. Lub oils contain a product made by reacting an allyl ester with an α-, β-unsaturated dicarboxylic acid or an anhydride thereof and esterifying the reaction product with a normal aliphatic alcohol having 8 to 18 carbon atoms.

U.S.P. 2,616,853 (11.5.49; 4.11.52). J. J. Giammaria, assr to Socony-Vacuum Oil Co. Lub oils contain a copolymer of maleic anhydride and a diester of itaconic acid, which copolymer has been reacted with a primary normal monohydric saturated aliphatic alcohol or a primary or secondary amine. The additives are V.I. improvers and pour point depressants.

U.S.P. 2,616,854 (13.11.43; 4.11.52). M. R. Fenske, assr to U.S.A. (Secretary of the Navy). Hydraulic fluid comprises *iso*paraffinic hydrocarbons boiling between 400° and 700° F, a polymer of a low boiling olefin, and a polymerized ester of acrylic acid.

U.S.P. 2,616,904–6 (28.12.51, 13.3.52, 28.3.52; 4.11.52). P. A. Asseff, T. W. Mastin, and A. Rhodes, assrs to Lubrizol Corpn. These patents are concerned with oil additives which are organic alkaline earth metal complexes and with methods of making the complexes.

U.S.P. 2,616,911 (28.12.51; 4.11.52). P. A. Asseff, T. W. Mastin, and A. Rhodes, assrs to Lubrizol Corpn. Organic alkaline earth metal complexes formed by use of sulphonic acids as promoters.

U.S.P. 2,616,924–5 (16.3.51; 4.11.52). P. A. Asseff, T. W. Mastin, and A. Rhodes, assrs to Lubrizol Corpn. Organic alkaline earth metal complexes and methods of making them.

U.S.P. 2,617,049 (16.3.51; 4.11.52). P. A. Asseff, T. W. Mastin, and A. Rhodes, assrs to Lubrizol Corpn. Organic barium complexes made from an oil-sol organic sulphonic acid or barium salt thereof, a phenol or barium salt thereof, an inorganic barium compound, water, and carbon dioxide.

U.S.P. 2,617,494 (10.2.50; 11.11.52). H. I. Becker, assr to General Electric Co. Hermetically sealed rotating equipment is lubricated by filling the casing surrounding the rotating member with an inert gas and having in the casing a pet lub oil in an amount only slightly more than is sufficient to saturate the inert gas at the operating temp of the equipment.

U.S.P. 2,617,768 (U.K. 10.2.48; 11.11.52). W. Pohl, assr to Shell Development Co. A marine engine lubricant capable of forming a stable emulsion when contacted with aq media comprising mineral oil 2 to 5% of a blown semi-drying oil and 0·1 to 5% of a basic alkaline earth metal salt of an oil-soluble pet sulphonic acid.

U.S.P. 2,617,769 (2.6.48; 11.11.52). C. W. Nichols, E. L. Armstrong, and H. J. Schroeder, assrs to Socony-Vacuum Oil Co. A rolling oil comprising an oleaginous lubricant, 0·1 to 3 wt % of water, and 0·5 to 15 wt % of a non-ionic emulsifier.

U.S.P. 2,618,597 (27.2.51; 18.11.52). J. G. McNab, N. V. Hokala, and J. P. McDermott, assrs to Standard Oil Development Co. Antioxidant for hydrocarbon oils is cuprous di-(methyl*cyclo*hexyl) dithiophosphate.

U.S.P. 2,618,598 (8.2.50; 18.11.52). A. J. Morway and P. V. Smith, assrs to Standard Oil Development Co. Lub greases comprise a lub oil thickened with a soap of a long chain fatty acid and a salt of a low mol. wt. acid of the formula R_1SR_2COOH, where R_1 and R_2 are hydrocarbon groups of 1 or 2 carbon atoms.

U.S.P. 2,618,599 (1.6.51; 18.11.52). L. F. King and W. C. Pattenden, assrs to Standard Oil Development Co. Lub greases comprise a lub oil thickened with a calcium soap of a C_{12} to C_{22} fatty material, a calcium soap of partially dehydrated castor oil, and a calcium soap of an aliphatic hydroxy carboxylic acid of not more than 6 carbon atoms.

U.S.P. 2,618,600 (15.7.48; 18.11.52). D. H. Moreton, assr to Douglas Aircraft Co. The E.P. properties of silicone lub oils are improved by adding a monoalkyl diarylphosphate and a trialkyl phosphate.

U.S.P. 2,618,601 (12.11.48; 18.11.52). D. H. Moreton, assr to Douglas Aircraft Co. Lubricant comprising a mineral lub oil, a dimethyl silicone polymer of lubricating visc, and a trialkyl phosphate.

U.S.P. 2,618,602 (17.12.49; 18.11.52). J. H. Bartlett, assr to Standard Oil Development Co. Pour point depressants for lub oils are polymerized dialkyl fumaroid esters of saturated aliphatic alcohols of 12 to 14 carbon atoms.

U.S.P. 2,619.458 (14.5.49; 25.11.52). B. V. McBride, assr to Westinghouse Electric Corpn. Lubricant comprising a disulphide, selenide, or telluride of molybdenium, tungsten, or titanium, and a hexavalent chromium compound as a corrosion inhibitor. These ingredients may be suspended in a volatile liq.

U.S.P. 2,619,459 (3.3.49; 25.11.52). L. L. Neff, assr to Union Oil Co. of California. Lub oil containing an oil-sol metal salt of the product obtained by condensing, in mineral oil soln, pet sulphonic acids and a hydrocarbon substituted phenol with an aldehyde.

U.S.P. 2,619,460 (26.3.49; 25.11.52). L. L. Neff, assr to Union Oil Co. of California. Lub oil containing a complex made by heating a mixture of phenol, pet sulphonic acids, and an aldehyde, converting the product to a metal salt and heating the salt with water and a basically reacting metal oxide, hydroxide, or salt of a weak acid.

U.S.P. 2,619,461 (4.1.50; 25.11.52). G. F. Ford, assr to Phillips Petroleum Co. Lub grease is made by mixing a fat with an oil, saponifying with caustic alkali, heating to 200° to 250° F, mixing with more oil, stirring to produce a fibre structure, and adding at 60° to 170° F a gel grease.

U.S.P. 2,619,462 (3.3.49; 25.11.52). L. E. Beare, M. P. Kleinholz, and W. G. Hoock, assrs to Sinclair Refining Co. Lub oil containing a chlorinated hydrocarbon and a reaction product of a bicyclic terpene, sulphur, a phosphorus sulphide, and an alkylphenol or alcohol.

U.S.P. 2,619,463 (France 3.3.49; 25.11.52). C. Jouandet and J. Riegert, assrs to Esso Standard S.A. Lub oil containing a chlorinated hydrocarbon, tricresyl, triphenyl, or trixylyl phosphate, and an oil shale dist product containing alkyl thiophenes.

U.S.P. 2,619,464 (25.3.49; 25.11.52). F. P. Otto, assr to Socony-Vacuum Oil Co. Lub oil containing a paraffin wax monothiocyanate.

U.S.P. 2,619,465 (25.4.51; 25.11.52). C. S. Scanley, assr to Standard Oil Co. Hydrocarbon oils and waxes are stabilized against oxidation by addition of 2-methyl-3-phytyl-1 : 4-naphthohydroquinone.

U.S.P. 2,619,482 (3.3.49; 25.11.52). L. E. Beare, M. P. Kleinholz, and W. G. Hoock, assrs to Sinclair Refining Co. This patent relates to the production of the reaction products used as additives in accordance with U.S.P. 2,619,462. J. M. S.

Ger.P. 857,845, 9.10.52. P. Hofmann, assr to Bad. Anilin- & Soda-Fabr. Process for obtaining hydrocarbon oils.

Ger.P. 857,999, 9.10.52. K. Fischer, assr to Edeleanu G.m.b.H. Process for obtaining lub oils.

Ger.P. 858,000. 9.10.52. Farbwerke Hoechst. Thickener for oily materials, *e.g.*, lubricants.

BrennstChemie, 1952, **33** (21–2). R. T.

Bitumen, Asphalt, and Tar

1238. A new way of dehydrating tar. H. Lüpke. *BrennstChemie*, 1953, **34** (1–2), 1–4.—Construction and operation of the plant are described with supporting illustrations. In continuous operation (40 tons/day) the H_2O cont of tar produced is reduced to 0·4%. Advantages over conventional processes are: lower steam consumption; lower wages; reduced transport costs; shorter delays in loading, and recovery of light oil and naphthalene. R. T.

1239. New viewpoints in processing tars from low temperature carbonization. C. J. Hansen. *BrennstChemie*, 1953, **34** (1–2), 4–6. (*Lecture at Coal Mtg., Chem-techn. Inst. Techn. High School, Aachen*, 29 *April*, 1952.)—Operating details and relative eff of processing methods for tars from various coals, to obtain valuable products, *e.g.*, phenols and diesel oils, are discussed. Diagrams and a tabulation are included.
R. T.

1240. Patents. U.S.P. 2,615,818 (21.8.50; 28.10.52). P. E. McCoy, assr to American Bitumuls and Asphalt Co. A bituminous–aq emulsion wherein the bituminous substance normally possesses poor adhesion for hydrophilic aggregate, containing ammonium persulphate in a small amount sufficient substantially to improve the adhesion of the bituminous substance to hydrophilic aggregate in the presence of water.

U.S.P. 2,615,819 (14.8.50; 28.10.52). D. N. Menzer, assr to American Bitumuls and Asphalt Co. A slow-setting oil-in-water-type emulsion relatively stable against breakdown on contact with electrolytes and consisting of water, a thermoplastic bituminous substance having been emulsified therein at a pH above 9, and an adhesion-promoting amount of ammonium formate, acetate, oxalate, or glutamate.
D. A. R.

Ger.P. 859,136, 23.10.52. W. Demann, assr to Kohlenwertstoff- A.G. Method for producting pitch coke poor in zinc.

BrennstChemie, 1952, **33** (21–2). R. T.

Special Hydrocarbon Products

1241. First complete Udex " B-T-X " plant makes nitration grade products. D. P. Thornton. *Petrol. Process.*, 1953, **8** (3), 384–7.—A new installation of a complete system for the recovery of petroleum benzene, toluene, and xylene in a single continuous operation has been put " on stream " in Texas by the Cosden Petrol Corpn. West Texas crudes are processed at a normal rate of 25,000 b.d., to give such products as straight run gasoline, kerosine, JP fuel, diesel fuel, heavy fuels, and asphalt products. Thermal cracking is also utilized.

A schematic flow diagram is given of the feed preparation and platforming sections, and the Udex and aromatic fractionating sections, of this new American refinery. There is a possibility that a synthetic ammonia plant of up to 30 tons/day capacity may be built in the near future to consume the recoverable hydrogen in the platformer gas. J. W. H.

1242. Petroleum oils and polymer hydrocarbons as dielectrics. V. A. Golubtsova and K. A. Andrianov. *Elektrichestvo*, 1953 (**1**), 51–6.—Materials investigated were bright stocks and blends thereof with " isol " (polymerized C_4 cracking gases) of mol. wt. 6000 to 8000 and poly*iso*butylene of mol. wt. 15,000 obtained by decomp (290° C) of P.I.B. of mol. wt. 76,000; binary mixtures of oil–rosin and oil–polymer and ternary mixtures of oil–rosin–polymer were examined. Polymer content was *ca* 3 to 4%, whilst rosin was 5 to 17%. All mixtures were approx iso-viscous (7° E/70° C). Oils alone showed flatter p.f/temp curve then blends, but rise in p.f. after ageing (120° C, 14 days, access to air) is greater and p.f/temp curve also steepens after ageing. Rosin acts as stabilizer both for oil and oil–polymer mixtures, as shown by flattening of p.f/temp curve after ageing with rosin addition. Best results were obtained with blend of bt. stock–P.I.B.–rosin ($92\frac{1}{2}/2\frac{1}{2}/5$), showing no rise in p.f. after ageing (tan δ at 100° C = approx 0·05). None of blends showed change in dielectric const after ageing. Original resistivity was higher for oil than for blends, but after ageing latter had higher val; ternary mixtures gave better results than binary. Breakdown tests yielded highest values on oil–rosin blends, *ca* 10% above figures for oil–polymer or ternary blends. Oil–polymer blends evolve gas under stress, such evolution is decreased by rosin addition. Ionization curves on test pieces impregnated with the mixtures show that addition of P.I.B.–rosin or rosin alone to oil lowers the p.f., especially at high stress, but all mixtures show sharp rise of p.f. with stress when latter exceeds 3 kV/mm. Tests for wax-formation can be accelerated by increasing the frequency from the usual value of 50 cycles. V. B.

1243. Sorbents for oil regeneration using thermo-syphons and adsorbers. S. M. Fridman. *Elektr. Stantsii*, 1952, **23** (11), 25–7.—Various grades of silica gel and other sorbents (alumina, aluminosilicates, natural clays, etc.) were checked for efficacy of acidity reduction on aged transformer oil (acid val *ca* 0·40). 2% of sorbent was used under static conditions, equilibrium being attained in 60 to 600 days. Best results were obtained with moulded alumina, which was about twice as effective as silica gel, and particularly suitable for removal of low mol. wt. water-sol acids. Suitability of such alumina was verified in full scale trials. V. B.

1244. Patents. U.S.P. 2,616,814 (30.9.49; 4.11.52). P. Mahler. Film forming composition comprising mineral spirits, a glycol, and a basic lime soap of tall oil.

U.S.P. 2,616,815 (12.4.50; 4.11.52). R. R. Parmentier. A transparentizing soln consisting of mineral oil, carbon tetrachloride and benzene, toluene, or xylene.

U.S.P. 2,616,825 (17.11.50; 4.11.52). E. E. Gilbert and S. L. Giolito, assrs to Allied Chemical and Dye Corpn. Decachlorotetrahydro-4 : 7-methanoindeneone is used as a pesticide.

U.S.P. 2,617,721 (26.9.50; 11.11.52). H. H. Schlesinger and D. T. Mowry, assrs to Monsanto Chemical Co. Fumaronitrile and chloro- and dichloro-fumaronitriles are used as herbicides.

U.S.P. 2,617,722 (6.12.50; 11.11.52). D. T. Mowry and A. H. Schlesinger, assrs to Monsanto Chemical Co. Compounds having the general formula $(ROOC)_2C{:}CHCCl_3$, where R is an alkyl group of 1 to 4 carbon atoms are used as herbicides.

U.S.P. 2,617,746 (19.12.49; 11.11.52). R. E. Parry, assr to Johns–Manville Corpn. Bloom discoloration of asbestos–cement sheets is inhibited by spreading over one surface of the uncovered sheet a dilute aq emulsion of paraffin wax and curing by autoclaving in a pressure steam atm.

U.S.P. 2,617,754 (29.8.49; 11.11.52). J. S. Neely, assr to Proctor and Gamble Co. Mineral oil and petrolatum are used in cosmetic creams. The remaining ingredients are firming agents containing an alcoholic group, non-ionic emulsifying agents, and a little water.

U.S.P. 2,618,384 (28.1.50; 18.11.52). J. M. Hatfield, assr to Pure Oil Co. A capsule for dyeing petroleum products comprises a pet hydrocarbon oil-sol dye blended with paraffin wax contained in a capsule made from microcrystalline wax.

U.S.P. 2,618,582 (1.11.48; 18.11.52). J. P. Buckman, assr to Union Oil Co. of California. Diphenyl disulphoxide is used as a pesticide.

U.S.P. 2,618,583 (9.8.49; 18.11.52). E. E. Gilbert, assr to Allied Chemical and Dye Corpn. Aq dispersions containing an organic solvent of high aromatic content and a compound RSO_2OR^1, wherein R is the phenyl or tolyl group and R^1 is a chlorinated phenyl group, are acaricides.

U.S.P. 2,618,803 (26.6.50; 25.11.52). J. Parmet. Dusting cloths are coated with a microcrystalline wax–mineral oil mixture which is solid at room temp.

U.S.P. 2,619,403 (U.K. 9.4.48; 25.11.52). J. Krause and J. A. Wainwright, assrs to Celanese Corpn of America. Kerosine, toluene, or xylene emulsified in water with a water-sol methyl cellulose is used as a printing-paste thickener.

U.S.P. 2,619,416 (2.11.49; 25.11.52). L. J. King, assr to Union Carbide and Carbon Corpn. Dichloral urea, α-hydroxy-β (trichloroethyl) carbamide, and N, N′-bis (α-hydroxy-β-trichloroethyl)-1 : 3-ethylene urea are herbicides. J. M. S.

Derived Chemical Products

1245. Naphthalene and nitrogen—new volume sources for petrochemicals. O. V. Tracy. *Petrol. Process.*, 1953, **8** (2), 250–2.—With the consumption of phthalic anhydride in the U.S. near the 250 million lb/year mark, the need for an increase in naphthalene production becomes apparent. Because of the shortage of this raw material in the U.S., the price per lb has more than doubled since 1945. The users of phthalic anhydride, producers of dibutyl phthalate and alkyd resins, have been importing their crude naphthalene from Europe. Steps are being taken to relieve the shortage of naphthalene in the U.S., and by 1957 the production of naphthalene is expected to be approx 500 million lb.

Nitrogen requirements for 1955 in the U.S. have been estimated to be 2·9 million tons, of which 2 million tons will be needed for agriculture. Part of the huge nitrogen requirement will come from the coal and coke industry, some will be synthesized as ammonia from coal, a larger part from natural gas, and some of it will come from pet. J. W. H.

1246. Patents. U.S.P. 2,613,204 (9.1.48; 7.10.52). L. C. Fetterley, assr to Shell Development Co. A crystalline molecular complex of urea with an unsubstituted oxy*cyclo*hydrocarbon.

U.S.P. 2,613,205 (23.4.49; 7.10.52). M. W. Hill, assr to Standard Oil Development Co. A product obtained by reacting a phosphorus sulphide with a hydrocarbon and neutralizing the acidic product with an organic base derived from guanidine.

U.S.P. 2,613,208 (29.6.49; 7.10.52). J. O. van Hook and W. J. Croxall, assrs to Rohm & Haas Co. Tertiary aminoethylbenzenes.

U.S.P. 2,613,214 (28.12.46; 7.10.52). H. Pines, assr to Universal Oil Products Co. A haloalkyl-chloromethyl-thiophene in which the haloalkyl group contains at least 2 carbon atoms and the halogen atom is combined with a carbon atom of said haloalkyl group other than the carbon atom attached to the thiophene ring.

U.S.P. 2,613,219 (20.10.49; 7.10.52). M. R. Clark, assr to A. R. Clark. A partially dehydrated metaborate or pyroborate ester of C_{4-10} mono-hydroxy *cyclo*alkane.

U.S.P. 2,613,231 (9.3.50; 7.10.52). A. J. Canale and J. F. Kincaid, assrs to Rohm & Hass Co. *cyclo*Octatetraene is preparing by tetramerizing acetylene over nickel monocyanide at 90° to 150° C and 100 to 800 psi.

U.S.P. 2,613,233 (28.12.48; 7.10.52). D. R. Blumer, assr to Phillips Petroleum Co. Mono-olefinic hydrocarbons are produced by chlorinating 2 : 3-dimethylbutane, separating the tertiary monochloride derivative from the reaction products by fractional dist and dehydrochlorinating the tertiary monochloride derivative.

U.S.P. 2,614,084 (10.3.47; 14.10.52). P. D. Caesar, P. G. Walds, and D. J. Crowley, assrs to Socony-Vacuum Oil Co. A wetting agent is prepared by sulphonating with conc sulphuric acid or oleum an alkylthiophene having a C_{4-25} alkyl group or groups and at least one nuclear hydrogen atom, and neutralizing the product with an alkali metal or ammonium hydroxide.

U.S.P. 2,614,130 (26.3.49; 14.10.52). H. Pines, B. Kvetinskas, and V. N. Ipatieff, assrs to Universal Oil Products Co. A diarylalkane is produced from an alkylated aromatic hydrocarbon by oxidative condensation with free oxygen between 100° and 250° C in the presence of aluminium or magnesium. The aromatic hydrocarbon (and the diarylalkane product) may be nuclearly chlorinated.

U.S.P. 2,614,919 (28.3.51; 21.10.52). J. C. R. Warren and F. M. M. J. Hager, assrs to United States Rubber Co. A herbicidal composition comprising an ester of an aryloxyacetic acid and an amine salt of an alkyl-substituted arylsulphonic acid as a surface active agent which is prepared by using the sulphonic acid as an esterification cat when esterifying the aryloxyacetic acid and subsequently neutralizing the sulphonic acid to form *in situ* the amine salt thereof.

U.S.P. 2,614,992 (30.11.50; 21.10.52). A. Mankowich, assr to U.S.A. (Secretary of the Army). A paint stripping composition comprising by weight 2·5 to 10% of dodecyl diethylene triamine, up to 15% of a non-ionic alkylated aryl polyethylene glycol ether surface active agent, the remainder being the sodium phosphate and sodium trisilicate.

U.S.P. 2,615,031 (18.7.51; 21.10.52). W. A. Stover, assr to Socony-Vacuum Oil Co. The chromic salt of a low mol. wt. fatty acid is prepared by reducing Cr^{+6} to Cr^{+3} with glycollic acid in the presence of a monobasic fatty acid having not more than 6 carbon atoms.

U.S.P. 2,615,051 (10.6.50; 21.10.52). H. W. Grote, assr to Universal Oil Products Co. Hydroquinone is etherified in aq soln with an alcohol or a dialkyl ether at a temp between 450° and 700° F.

U.S.P. 2,615,786 (28.8.48; 28.10.52). W. A. Proell and W. F. Wolff, assrs to Standard Oil Co. C_{12}–C_{18} mercaptans are made by intimately mixing a liquid hydrocarbon charging stock containing substantial amounts of C_{12}–C_{18} tertiary olefins with a liquid alkanesulphonic acid cat and introducing H_2S into the liquid phase mixture at a temp between 0° and 60° C.

U.S.P. 2,615,823 (30.3.50; 28.10.52). F. E. Lawlor and F. Casciani, assrs to Niagara Alkali Co. A method of destroying micro-organisms by contacting them with a di-alkoxytetrachlorobenzene or a tri-alkoxytrichlorobenzene.

U.S.P. 2,615,852 (14.12.48; 28.10.52). E. T. Kocher, assr to Visco Products Co. An oil-in-water emulsion is broken with a molecularly dehydrated condensation product of zinc chloride and an alkylolamine.

U.S.P. 2,615,853 (4.11.48; 28.10.52). W. H. Kirkpatrick and J. W. Ryzner, assrs to Visco Products Co. A water-in-oil emulsion is broken with an aliphatic ether alcohol having a polyoxyalkylene group.

U.S.P. 2,615,908 (19.7.50; 28.10.52). D. A. McCaulay and A. P. Lien, assrs to Standard Oil Co. A complex compound having the mol composition 3 AS, 3 HF, CuF, in which AS is a saturated hydrocarbon thioether.

U.S.P. 2,615,906 (22.5.48; 28.10.52). R. Stanton. Alkylated lead is prepared from a lead–alkali metal alloy and an alkyl chloride, employing high-speed agitation induced by fluid propulsion.

U.S.P. 2,615,901 (11.5.49; 28.10.52). P. P. McClellan, assr to Jefferson Chemical Co. Ethylene oxide is freed from acetaldehyde by dist, in which substantially pure ethylene oxide is removed overhead and substantially all the acetaldehyde is removed in a side-stream, which also contains some ethylene oxide, and hydrating the ethylene oxide in the side-stream to give ethylene glycol, which is fully recovered in a dilute soln free from acetaldehyde.

U.S.P. 2,615,899 (23.6.49; 28.10.52). G. W. Sears, assr to E.I. du Pont de Nemours and Co. Ethylene oxide is produced from ethylene and an oxygen-containing gas at 150° to 400° C using a fluidized silver cat mixed with artificial graphite as a diluent.

U.S.P. 2,615,847 (27.1.50; 28.10.52). K. M. Thompson, assr to Atlantic Refining Co. A detergent comprising a mixture of water-sol monoalkyl aryl sulphonates and water-sol di-alkyl aryl sulphonates in specified proportions.

U.S.P. 2,615,827 (3.1.50; 28.10.52). A. J. Shmidl, assr to Standard Oil Development Co. A fungicide and insecticide comprises a chlorinated duroquinone containing about 54·5% by weight of chlorine substituted on the non-aromatic carbon atoms, a hydrocarbon, a wetting agent, and water. D. A. R.

U.S.P. 2,616,930 (27.9.50; 4.11.52). L. Schmerling, assr to Universal Oil Products Co. Bi*cyclo*alkylaryl ethers of polyalkylene glycols.

U.S.P. 2,617,772 (17.6.50; 11.11.52). V. J. Keenan, assr to Atlantic Refining Co. Detergent comprising a water-sol salt of an alkylaryl sulphonic acid and 20 to 70% of lecithin.

U.S.P. 2,618,649 (Netherlands 4.5.48; 18.11.52). T. H. van Bavel and P. W. O. Wijga, assrs to Shell Development Co. Surface-active phosphates and sulphates derived from high-boiling by-products of the manufacture of oxo-alcohols from C_8 to C_9 olefins.

U.S.P. 2,619,469 (5.12.49; 25.11.52). R. F. Heald, assr to Colgate–Palmolive–Peet Co. Milled detergent flakes comprising 30 to 50% of a water-sol salt of an organic sulphuric acid reaction product having an alkyl group of 8 to 22 carbon atoms, 50 to 70% of an inorganic sulphate, and 1 to 5% of a polyhydric alcohol, a fatty acid or a partial ester of a polyhydric alcohol and a fatty acid.

U.S.P. 2,619,491 (8.7.48; 25.11.52). C. W. Smith, assr to Shell Development Co. Tetrahydropyranyl ethers.

U.S.P. 2,619,508 (30.6.49; 25.11.52). L. A. Mikeska and L. T. Eby, assrs to Standard Oil Development Co. Polyether-alcohols containing thioether substituents. J. M. S.

Ger.P. 857,954, 9.10.52. Standard Oil Development Co. Process for separating isoprene from a hydrocarbon reaction.

Ger.P. 858,246, 9.10.52. K. Sauerwein, assr to Chemische Werke Hüls G.m.b.H. Method for producing butadiene.
BrennstChemie, 1952, **33** (21–2). R. T.

Coal, Shale, and Peat

1247. Plastic properties of coking coals. J. Brownowski, D. FitzGerald, D. W. Gillings, and D. C. Rhys-Jones. *Nature, Lond.*, 1953, **171**, 389.—It is postulated that coking coals behave as liquids at 300° C and higher temp, and at 400° C these liquids decompose to a gas and an infusible solid. Developing this argument mathematically, it is shown that when log (viscosity) is plotted against time (t) at const temp, for $t \to 0$ the slope tends to λk where k is the rate constant of the decomposition and λ is a constant ~ 1; for $t \to \infty$ the slope tends to k.

Viscosity measurements were made on four coals between 400° and 450° C; the precision of the experiments was such that small variations in λ could not be detected, but it can be said that $0{\cdot}8 \leqslant \lambda \leqslant 1{\cdot}2$, and the plot of log (viscosity) *vs* t was essentially

a straight line. The calculated activation energy of the carbonization process was *ca* 50 k.cal/mol in all cases, which is similar to that required to break the C–C bond in the thermal decomposition of mineral oils. H. C. E.

1248. Moulded bodies of coal and coal products. W. Kaufmann. *BrennstChemie*, 1953, **34** (1–2), 6–11. (*Lecture at Coal Mtg., Chem-techn. Inst., Tech. High School, Aachen, 29 April*, 1952.)—Production and properties of corrosion-resistant, moulded bodies for pet and chem industries are described. A tabulation of types, applications, and numerous illustrations are included. Corrosion-resistance to sp chemicals is given for proprietary compositions whose physical properties are tabulated. 14 refs. R. T.

1249. Contribution to knowledge of the course of the physical and chemical processes in the thermal treatment of raw peat. E. Terres and K. Schultze. *BrennstChemie*, 1952, **33** (21–22), 353–61. (*Lecture at Mtng. German Soc. for Mineral Oil Research and Coal Chem., Goslar*, 1952, Oct. 2–4.)—An investigation of newer, fibrous, and older, rotted, peats is presented. The various colloidal material groups differ in thermal stability. Destruction of the colloidal nature in fibrous peats begins slightly above 100° C and is complete at 200° C. Rotted peats are stable to *ca* 120° C and destruction extends from *ca* 120° to *ca* 300° C. The irreversible destruction of the most stable colloid groups occurs at *ca* 300° C. The exothermic decarboxylation-dehydration are pronounced time reactions which proceed quicker at higher temp, but only those material groups are comprised which are subject to cracking at the temp concerned. These reactions are complete at about 300° C in 1 to 1·4 hr, but only 55% at 200° C, owing to the different temp stabilities. Decarboxylation-dehydration reactions set in at *ca* 150° C and run concurrently with endothermic colloid destruction. Advantage is taken of the fact that the thermal colloid destruction is not a time reaction to separate it from the exothermic chem time reactions. Very short heating times are adopted so that, before the decarboxylation–dehydration, up to *ca* 80 to 90% of the originally combined water can be separated. On this is based a corresponding process for dehydration and enrichment of raw peat which gives essentially improved heat economy of the whole process so that in many cases the heat developed by the exothermic process almost suffices as a heat source. The combination of the thermal colloidal destruction with decarboxylation and dehydration, which yields peat coke equiv to coal coke, gives better heat economy. Peat coke producible from peat charcoal exhibits outstanding reactivity compared with coal coke. R. T.

1250. Patents. U.S.P. 2,618,537 (France 19.4.49; 18.11.52). J. L. M. Rabu. Fuel briquettes made by wetting solid carbonaceous fuel particles with an aq soln of a wetting agent, mixing with an aq bitumen emulsion, de-aerating the mixture, extruding the de-aerated mass, forming the extrusion mass into a sheet under pressure, dividing the sheet into sections of briquette shape under heavy pressure, and drying the briquettes.

U.S.P. 2,618,544 (29.6.51; 18.11.52). H. G. M. Fischer and A. B. Welty, assrs to Standard Oil Development Co. Water gas generation from coal using fluidized solid technique.

U.S.P. 2,618,588 (21.6.49; 18.11.52). C. E. Jahnig, assr to Standard Oil Development Co. Fluidized shale dist.

U.S.P. 2,618,589 (21.6.49; 18.11.52). E. W. S. Nicholson and L. I. Griffin, assrs to Standard Oil Development Co. Coatinuous retorting of shale. J. M. S.

Miscellaneous Products

1251. Influence of carbon black on the oxidation of natural rubber. G. J. Amerongen. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 377–9.—Experiments were carried out to determine the extent to which solubility of oxygen in natural rubber was affected by carbon blacks of various particle sizes in the rubber. Suggested that O_2 solubility increases with carbon particle size, and that O_2 solubility has bearing on wear characteristics of the rubber. E. J. C.

1252. Ethylene. Anon. *Chem. Engng*, 1953, **60** (3), 272–5.—Line diagram of plant, with operating temp and pressures, for the cracking of ethane or propane, or a mixture of both, to produce an ethylene-rich effluent. The feed supply is the refinery off-gas from cracking petroleum stocks, or the effluent from ethane–propane cracking.

D. M.

1253. Patents. U.S.P. 2,616,860 (3.9.51; 4.11.52). W. H. Leukhardt and J. W. Adams, assrs to United States Rubber Co. Synthetic rubber latex obtained by the emulsion polymerization of 1 : 3-butadiene or mixtures thereof with copolymerizable compounds containing a $CH_2{=}C<$ group is reinforced by mixing with an aq dispersion of hydrated silica containing a polyethylene polyamine and coagulating the mixture.

U.S.P. 2,616,863 (28.10.50; 4.11.52). H. S. Bloch and E. M. Geiser, assrs to Universal Oil Products Co. Drying oil composition consisting of 75 to 95 wt % of a mixture of polymerized polyolefinic cyclic hydrocarbons and 5 to 25 wt % of a styrenated unsaturated fatty acid ester drying oil.

U.S.P. 2,616,876 (6.5.49; 4.11.52). J. Rehner and P. J. Flory, assrs to Standard Oil Development Co. Hydrocarbon rubbery elastomers are cured by mixing with a meta-dinitroso aromatic compound.

U.S.P. 2,617,149–52 (31.12.49; 11.11.52). L. C. Rubin, assr to M.W. Kellogg Co. These patents relate to various methods of forming sheets from and moulding polymers of trifluorochloroethylene.

U.S.P. 2,618,616 (27.7.50; 18.11.52). R. W. H. Tess and T. F. Mika, assrs to Shell Development Co. Resinous reaction products of a polycarboxylic acid, anhydride, or halide, an alcohol containing at least 3 esterifiable hydroxyl groups, a drying oil or drying oil fatty acid or ester thereof, and an aromatic monocarboxylic acid having a tertiary alkyl substituent.

U.S.P. 2,618,624 (15.2.49; 18.11.52). W. J. Sparks and L. B. Turner, assrs to Standard Oil Development Co. Composition consisting of 27·3 wt % of polystyrene having a Staudinger mol. wt. of 80,000 to 130,000, 18·2 wt % of poly*iso*butylene having a Staudinger mol. wt. of 100,000 and 54·5 wt % of a styrene–*iso*butylene copolymer having a Staudinger mol. wt. of 100,000.

U.S.P. 2,619,477 (7.5.49; 25.11.52). F. W. Banes and E. Arundale, assrs to Standard Oil Development Co. A copolymer of dimethyl itaconate and 1 : 3-butadiene.

U.S.P. 2,619,481 (28.4.49; 25.11.52). F. P. Baldwin and W. C. Smith, assrs to Standard Oil Development Co. A curable composition comprising a copolymer of *iso*butylene and a multi-olefin having 4 to 14 carbon atoms, a substance containing a quinonoid nucleus and 2 : 2′-benzothiazyl disulphide or benzothiazyl-2-mono*cyclo*-hexyl sulphenamide.

J. M. S.

Corrosion

1254. Glassed steel. E. A. Sandford and O. J. Britton. *Chem. Engng*, 1953, **60** (3), 294–304.—The corrosion resistance of this construction material to a number of corrosives is shown on a number of charts.

D. M.

1255. Stainless steels. Anon. *Chem. Engng*, 1953, **60** (4), 290–300.—A discussion of the important factors to watch in the selection of any stainless steel, regardless of grade, such as operating conditions, design, and fabrication requirements.

D. M.

1256. Biological deterioration of polysulphide polymers employed as linings for gasoline storage tanks. F. H. Allen and D. Fore, Jr. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 374–7.—In warm, humid climates, and under certain operating conditions, polysulphide linings for underground concrete gasoline tanks were found to suffer severe deterioration. The cause of this was established as being due to moulds and bacteria which enter from the soil. Pentachlorophenol addition to the polysulphide polymer during manufacture provides an effective method of controlling the attack.

E. J. C.

1257. Corrosion case history. Anon. *Oil Gas J.*, 30.3.53, **51** (47), 193.—An account is given of a corrosion problem in a depropanizer tower in the Philadelphia refinery of Gulf Oil Co and remedies taken described. G. A. C.

1258. In-place tube cleaning pays. Anon. *Petrol. Process.*, 1953, **8** (2), 228–9.—The use of muriatic acid has been found to be effective in the removal of seawater scale from non-ferrous tube-and-shell heat exchange equipment at a refinery in Aruba, Netherland West Indies. The acid is circulated through the equipment by means of a simple, portable, shop-built unit which is attached to pre-installed connexions on the condenser or cooler. By means of this cleaning method, many advantages are claimed; these include an improvement in heat transfer of 75% and a reduction in cleaning time of 75%.

A complete procedure outline for this method of acid cleaning is given for the case of a bank of two condensers. The apparatus, mounted on a wheeled platform, is also described. J. W. H.

1259. How to combat erosion in fluid catalytic crackers. J. S. Clarke. *Oil Gas J.*, 23.3.53, **51** (46), 262.—Results of various tests made by the Standard Oil Development Co to evaluate plant erosion are given. Cases include erosion of grids, inlet distributors, injection points, cyclones, overhead lines, and water sprays. G. A. C.

1260. Acidproof cement lining halts corrosion. D. H. Stormont. *Oil Gas J.*, 23.3.53, **51** (46), 255.—Use of acidproof cement lining in place of alloy cladding of a vac flasher column at Shell Oil Co's Wilmington, California, refinery is described. Cost of installation is $\frac{1}{3}$ that of alloy cladding. G. A. C.

1261. Laboratory apparatus for studying oil well subsurface corrosion rates and some results. P. J. Kalish, J. A. Rowe, and W. F. Rogers. *Corrosion*, 1953, **9** (1), 25–33.—The apparatus provides means for making corrosion tests with brine under bottom hole conditions, *i.e.*, in the absence of oxygen and with the acid gases present which are normally released at atm pressure. Corrosion was measured by the current produced in an iron–platinum cell immersed in the brine, and was accelerated by increasing temp and liq velocity. Measurements indicated that the pH under bottom hole conditions may be up to 2·5 units lower than that measured at the top. It has been found that alkyl mercaptans act as inhibitors of corrosion in the presence of sulphide. K. G. B.

1262. The coupon technique—a valuable tool in corrosion testing. H. L. Bilhartz and H. E. Greenwell. *Corrosion*, 1953, **9** (2), 66–73.—A detailed description is given of the procedure for preparing corrosion-test coupons, installing them in plant, and assessing the resultant corrosion. K. G. B.

1263. The corrosion of lead in the petroleum industry—2. M. Karsulin and T. Markovic. *Nafta* (*Yugoslavia*), Nov. 1952, **11**, 353–9.—Corrosion phenomena have been considered from the standpoint of mechanical inhomogeneity of lead surfaces. Corrosion measurements have been carried out by determining the current strength of an element consisting of two lead plates ($2{\cdot}2 \times 2{\cdot}2 \times 0{\cdot}18$ and $2 \times 0{\cdot}18$ cm respectively) of same chemical composition. One of these plate surfaces was made rough by glass-paper treatment, and the other made smooth by polishing with a felt cloth. The potentials of these plates, which were connected in a short circuit by a milli-amperemeter, have been measured *vs* time and current strength.

It was established that between such plates of different surface conditions polarity alterations arose between the electrodes, whether the electrolyte (conc sulphuric acid) was at rest or being stirred. At the beginning or cessation of each stirring, a polarity alteration was observed. This phenomenon is explained by a moto-electrical effect, which is caused by the alteration of the concentration gradient on the electrodes, *i.e.*, by the movement of the electrolyte.

In another series of experiments, polarity oscillations have been measured in systems consisting of: (1) 70 vol % of crude oil piled up with 30 vol % of conc sulphuric acid, and (2) 70 vol % of engine or heavy oil respectively, piled up with 30 vol % of conc sulphuric acid. Finally, it has been shown that in this way crude oils can be differentiated, according to their composition. (Authors' abstract.)

1264. The corrosion of lead in the petroleum industry—3. M. Karsulin and T. Markovic. *Nafta* (*Yugoslavia*), Dec. 1952, **12**, 393–8.—Polarity alterations were observed in 2N-NaOH, in the same way as in conc H_2SO_4 (see previous Abs.), between two lead electrodes of different surface conditions, which were connected in a short circuit. A general scheme has been presented about these processes, showing that, previous to polarity alteration, the rough electrode always has a higher potential than the smooth one, while after polarity alteration the reverse is the case.

The influence of the anode surface on the depolarization current in the element Pt–Pb (rough) and Pt–Pb (smooth) has been discussed. It has been established that, depending on the electrode surface, differences in current intensity are observed in the case of NaOH and NaCl. Consequently, the Tödt method is not suitable for quantitative determinations, if the condition of the anode surface is not taken into account. The investigation of the corrosion of lead in NaCl soln of different concentrations by the Tödt method gave satisfactory results.

Furthermore, the action of sulphur-containing agents (H_2S, Na_2S) on the corrosion of lead in NaCl, NaOH, and H_2SO_4, has been investigated. Depending upon the concentration of sulphur in the electrolyte, lead sulphides are formed, which partially inhibit the corrosion of lead in these soln. The intensities of corrosion currents in these systems are dependent upon the NaOH concentration (NaCl and H_2SO_4 respectively), which influences the solubility of the sulphur layer formed on the lead surface. (Authors' abstract.)

1265. Control of internal corrosion of tankers. Pt 3—Corrosion control in practice. A. B. Kurz. *Mot. Ship*, Mar. 1953, **33** (396), 528.—A description is given of two fundamental methods of corrosion control tested over a number of years in one tanker, belonging to the Keystone Shipping Co., and of the results obtained. These methods, applied simultaneously, were the chemical inhibition of non-ballast tanks, using a special solution of an inexpensive but effective inhibitor, and galvanic protection of ballast tanks using magnesium anodes. U. M.

1266. Does cathodic protection constitute a fire hazard?—2. M. E. Parker. *Oil Gas J.*, 16.3.53, **51** (45), 157.—This part of the series on corrosion control concerns hazards in connexion with cutting of cathodic protection cables and precautions to preclude possible ares.

Design features for safety are outlined. G. A. C.

1267. Your corrosion engineer. F. L. Laque. *Petrol. Process.*, 1953, **8** (2), 230–3.—The attributes and duties of a corrosion engineer have been listed, together with the results that a management should expect from a competent man. He should have access to information concerning the properties of materials, their availability, and cost. Fabrication techniques are also important.

The main duties of this engineer are obvious, but minor duties, such as the setting-up of standards and specifications should never be neglected. He should be able to effect savings in plant and maintenance to at least ten times his salary each year. This can be done in many ways, ranging from the preservation of equipment to give maximum life, to the elimination of working hazards. J. W. H.

1268. Patents. U.S.P. 2,614,980 (3.4.50; 21.10.52). M. L. Lytle, assr to Standard Oil Development Co. Corrosiveness of a petroliferous well fluid, including moisture and H_2S, is reduced by adding to the fluid a reaction product of a C_{12} to C_{26} fatty acid, or a fatty oil containing radicals of such fatty acid, with an alkyl or alkanol amine having between 6 and 18 carbon atoms per mol obtained under specified conditions and in the presence of an alkaline cat.

U.S.P. 2,614,982 (3.4.50; 21.10.52). J. A. Caldwell and M. L. Lytle, assrs to Standard Oil Development Co. Corrosiveness of petroliferous well fluid, including moisture and H_2S, is reduced by adding to the fluid a product obtained by reacting a C_{12} to C_{26} fatty acid or a fatty oil containing the radical of such fatty acid, with a polyethylene glycol having from 3 to 30 ethanoxy groups, under specified conditions and in the presence of an alkaline cat.

U.S.P. 2,615,815 (21.12.48; 28.10.52). G. D. Galvin and A. E. McAulay, assrs to Shell Development Co. A composition for displacing moisture and preventing corrosion to metals having the following constituents and proportions by wt: limed pet residue rich in natural cyclic acids, 20%; lanolin, 10%; oil-soluble petroleum sulphonate, 3%; zinc naphthenate, 5%; diacetone alcohol, 2%; white spirits, balance. D. A. R.

U.S.P. 2,617,713 (15.4.48; 11.11.52). G. W. Ayers, E. E. Harton, and L. R. Mazurk, assrs to Pure Oil Co. Ferrous metals coming into contact with alkali soln are protected from corrosion by adding to the soln an alkali metal thiosulphate.

U.S.P. 2,617,771 (30.7.48; 11.11.52). J. T. Rucker, assr to Hooker Electrochemical Co. Metals are protected against corrosion by dilute aq acids by adding to the acids lauryl pyridinium thiocyanate or lauryl dimethyl benzyl ammonium thiocyanate. J. M. S.

Engines and Automotive Equipment

1269. Combustion chamber deposits in aero-engines. A. R. Griffin. *Ingenieur, 's Grav.*, 27.3.53, **64** (13), L15–19.—A survey of the deleterious effects of combustion chamber deposits on engine performance is given and the efficiency of lead scavengers (ethylene dibromide) is discussed. The beneficial effects of tricresyl phosphate as a fuel additive and the mechanism by which it reduces plug fouling are described. Flight tests have shown reductions in plug fouling of 60 to 80% on fuel containing T.C.P., compared with untreated fuel. Finally, the future possibilities of fuel additives are considered. The paper is in English. G. F. T. C.

1270. Combustion in the jet engine. K. T. Fulton. *Aeroplane*, 20.3.53, **84** (2174), 344.—The work of Joseph Lucas Ltd. in the design, development, and production of jet engine combustion systems is described and illustrated. U. M.

1271. A 6500-S.H.P. marine gas turbine. Anon. *Mot. Ship*, Mar. 1953, **33** (396), 520.—An illustrated description is given of English Electric Co.'s parallel-flow type unit, originally intended for installation in a frigate. U. M.

1272. Mirlees introduce new large [diesel] engine. Anon. *Gas Oil Pwr*, 1953, **48**, 34–7, 48.—The K series of engines comprises from 5 to 8 cyl normally aspirated, and from 6 to 8 cyl pressure charged. A 12-cyl Vee-form unit is made both normally aspirated and pressure charged. The cyl dimensions are 15-inch bore and 18-inch stroke, and the outputs at the rated speed of 428 r.p.m. are 138 and 207 b.h.p/cyl when normally aspirated and pressure charged respectively. The corresponding b.m.e.p.s are 80 and 120 psi.

The engine construction is described. The pistons are of cast iron, and the undersides of the crowns are cooled by oil supplied through drilled passages in the connecting rods. The pistons carry 3 compression and 2 scraper rings. The cyl heads each carry 2 inlet and exhaust valves, relief valve and fuel injection valve, and max pressure indicator attachment.

Pressure lubrication is supplied to the main bearings, connecting rods, large and small end bearings, camshaft bearings, governor, and gear wheels. The pistons and cams are splash lubricated, and the valve gear mechanism is grease lubricated.

Starting is accomplished by compressed air at 300 psi. The fuel consumption was found to be as low as 0·335 lb/b.h.p/hr.

The article is illustrated with 2 graphs, 5 cuts, and 7 line drawings. H. C. E.

1273. Fuel conversion equipment. Anon. *Engineer, Lond.*, 1953, **195**, 476.—R. A. Lister Co's Mk. D petrol engine may be converted to run on tractor vaporizing oil by fitting a conversion kit consisting essentially of a small cast iron vaporizer and auxiliary petrol tank. C.R. reduced from 5 : 1 to 4·5 : 1 by installing an additional gasket, and engine started and stopped on petrol. Due to price differential between petrol and tractor vaporizing oil, fuel costs reduced by $\frac{2}{3}$. A. C.

1274. Patents. U.S.P. 2,612,746 (4.3.48; 7.10.52). R. H. Goddard, assr to Daniel and Florence Guggenheim Foundation. A discharge nozzle for a combustion chamber, producing striated flow of combustion gases, is conical and rearwardly expanding, surrounded by a water jacket, and provided with a number of ports having tubular extensions through the jacket.

U.S.P. 2,612,749 (11.4.46; 7.10.52). W. L. Tenney and C. B. Marks, C. B. Marks, assr to W. L. Tenney. Resonant pulse jet device with restricted flow passage.

U.S.P. 2,612,750 (24.7.46; 7.10.52). R. H. Goddard, assr to Daniel and Florence Guggenheim Foundation. A rotatable combustion chamber having a tangentially arranged auxiliary jet and vapour cooling means.

U.S.P. 2,612,251 (G.B. 27.12.45; 7.10.52). D. H. Ballantyne, assr to Rolls Royce Ltd. A gas turbine engine is provided with interconnected control for starter mechanism and an exhaust outlet valve to facilitate starting.

U.S.P. 2,612,840 (13.5.48; 7.10.52). R. A. Lasley, assr to L. G. Simmons. A fuel injection system has a pair of valves, retraction means for withdrawing fuel from the fuel line on the outflow side of the valves during their closing movement, and means whereby the opening of the valves and the amount of fuel withdrawn by retraction means is dependent upon variations in the metered amounts of fuel supplied by a pump.

U.S.P. 2,612,841 (29.9.48; 7.10.52). R. A. Lasley, assr to L. G. Simmons. Variable retraction discharge valve for fuel injection pumps.

U.S.P. 2,612,842 (13.11.46; 7.10.52). G. S. Kenmore and R. R. Fruehauf, assrs to Worthington Corpn. A fuel injection pump has a relatively small plunger and cyl for providing a relatively slow rate of injection, a larger plunger and cyl for providing a relatively higher rate of injection and by-pass means controlled by small plunger for by-passing fuel from the small to the large cyl.

U.S.P. 2,612,880 (11.1.47; 7.10.52). C. H. Schowalter, assr to Fairbanks, Morse, and Co. An I.C. engine of two-cycle type having means for the supply of gas fuel and oil fuel.

U.S.P. 2,613,498 (25.10.49; 14.10.52). J. J. Prendergast, assr to General Electric Co. A gas turbine power plant, having bearings of the high pressure air-sealed type, is provided with means to separate air from the oil discharged from the bearings and to burn oil vapour in the separated air.

U.S.P. 2,613,499 (4.2.48; 14.10.52). C. N. Lawter, assr to Packard Motor Car Co. Starter and ignition means for turbojet engines.

U.S.P. 2,613,500 (Sweden 22.6.45; 14.10.52). A. Lysholm. Gas turbine power plant having means for joint control of the fuel and air supply, including means for varying the compressor characteristic to adapt it automatically to changes in fuel supply, speed, and load.

U.S.P. 2,613,501 (2.6.45; 14.10.52). N. C. Price, assr to Lockheed Aircraft Corpn. A gas turbine has an annular heat exchanger coaxial with the rotor and aligned with the combustion chamber, which receives exhaust gases from the turbine and conducts compressed air from the compressor to the combustion chamber.

U.S.P. 2,614,384 (G.B. 16.1.45; 21.10.52). G. B. R. Feilden, assr to Power Jets (Research and Development) Ltd. Gas turbine power plant having a plurality of flame tubes and axially slidable means to expose same.

U.S.P. 2,614,386 (G.B. 20.2.45; 21.10.52). R. C. McLeod, G. B. R. Feilden, and J. Hodge, assrs to Power Jets (Research and Development) Ltd. Supporting and reinforcing structure for gas turbine engines.

U.S.P. 2,614,494 (Germany 1.10.48; 21.10.52). W. Voit and U. Aldinger, assrs to Robert Bosch G.m.b.H. Single piston injection pump for a multi-cylinder internal combustion engine in which a distributor plunger reciprocates, and also oscillates, about its axis.

U.S.P. 2,614,546 (22.1.48; 21.10.52). A. Schwarz, assr to Sinclair Research Laboratories Inc. An I.C. engine having a rotary valve housed in the cylinder head.

U.S.P. 2,614,549 (27.9.50 ; 21.10.52). P. S. Vaughan, assr to American Locomotive Co. A cyl head for a compression ignition engine having means to direct the flow of incoming air on to the shoulder of the inlet valve.

U.S.P. 2,615,300 (G.B. 11.3.47 ; 28.10.52). A. A. Lombard, assr to Rolls Royce Ltd. A combustion chamber for aircraft gas turbines has a flame tube mounting which allows radial and axial expansion of the flame tube, in relation to an external air casing. D. A. R.

U.S.P. 2,616,404 (7.10.48 ; 4.11.52). E. Bartholomew, assr to Ethyl Corpn. Apparatus for supplying auxiliary fuel or anti-knock fluid to I.C. engines.

U.S.P. 2,616,405 (20.11.48 ; 4.11.52). E. Bartholomew, assr to Ethyl Corpn. Enrichment device for I.C. engines and method of controlling the same.

U.S.P. 2,617,633 (1.12.48 ; 11.11.52). W. van den Bosch, assr to Ross Washer. Gasifier for heavy fuels in I.C. engines using heat from the exhaust in heat exchange with the fuel. J. M. S.

Safety Precautions

1275. Patent. Ger.P. 860,212, 30.10.52. H. Schilling, F. Zobel, and W. Hunsmann, assrs to Bad. Anilin- & Soda-Fabr. Procedure to prevent explosion of unsaturated hydrocarbons inclined to spontaneous decomp.
BrennstChemie, 1952, **33** (21–2). R. T.

Miscellaneous

1276. Summary of refineries in the United States. Anon. *Oil Gas J.*, 23.3.53, **51** (46), 312.—Refineries in the U.S. are listed state by state ; number of plants, type of operation, and products being shown. G. A. C.

1277. L.P.G. sales register modest advance in 1952. G. R. Benz and P. W. Tucker, *Petrol. Refin.*, Jan. 1953, **32** (1), 66–9.—Sales of liquefied pet gas continued to increase in 1952, although the rate of increase was less than in 1951. Sales were 6·7% above the previous year. Almost half the liq produced as natural gasolines are L.P.G. The outlook for 1953 is for increased production and sales. The sales of L.P.G. for the manufacture of chemicals is estimated to be 4·0% in excess of 1951. A. R. H.

1278. 1967—What will be the product demand? J. W. Boatwright. *Petrol. Refin.*, Nov. 1952, **31** (11), 79–84.—It is estimated that the total demand of pet products in 1967 will be 39% in excess of the 1951 demand. Despite this increase, the petroleum industry will be able to meet this demand provided a favourable environment is created, characterized by monetary stability, free prices, intelligent labour relationships, and a sound highway development programme. A. R. H.

1279. Effect of multitesting on refinery costs. M. R. Morrow and C. T. Shewell. *Industr. Engng. Chem.* (*Industr.*), 1953, **45**, 240–6.—A new statistical approach was made to the problem of testing and quality control of petroleum products. Claimed that this approach resulted in considerable savings in the cost of a motor gasoline.
E. J. C.

1280. Simplify your cost estimates. L. Lynn and J. R. McKlveen. *Chem. Engng*, 1953, **60** (4), 193–5.—Using nomographs, a complete economic picture can be presented without the need for numerous graphs and tables. An example is quoted for demonstration. D. M.

1281. Should your plant produce power? W. B. Wilson. *Chem. Engng*, 1953, **60** (3), 235–8.—Describing factors to be taken into account when considering the economic usage of potential by-product power. D. M.

1282. How to plan power distribution. W. B. Wilson. *Chem. Engng*, 1953, **60** (4), 199–203.—An analysis of the distribution and utilization of a plant power system. Equipment costs *vs* power are given graphically. D. M.

1283. Simplifying data correlations by nomographs. G. E. Mapstone. *Petrol. Refin.*, Jan. 1953, **32** (1), 119–23.—By the construction of a monograph, it can be determined if there is a relation between a family of curves representing experimental data. A. R. H.

1284. Petroleum and the law. V. Biske. *Inst. Petrol. Rev.*, 1953, **7** (74), 49.—This article first defines "petroleum" according to the 1928 Act, "petroleum spirit" having a flash point (Abel) below 73° F, the Abel flash point method being discussed. Various other Acts and Orders give definitions for different purposes. "Refinery" is defined rather simply by the Customs and Excise Act of 1952, but the application of other Acts of Parliament to pet refineries is also discussed. The various aspects of law dealing with the storage of pet spirit are detailed, covering both commercial and domestic gauges. Heavy oil vehicles are also mentioned. Finally, the various official publications dealing with the law as it affects the pet industry are mentioned. R. H.

1285. Industrial petroleum chromatography. H. Weil. *Petroleum, Lond.*, April 1953, **16** (4), 95–9.—This article describes the work of the U.S. National Bureau of Standards and the API associated with the American Petroleum Research Project No. 6 (cf. Abs. 1435 (1951); 188 and 726 (1952) and 991 (1953)). In this part, developments of the Project since 1945 are described, and further developments and future prospects are discussed. 52 refs are given. R. E. P.

1286. Ductile cast iron. Anon. *Petrol. Process.*, 1953, **8** (2), 234–5.—Ductile cast iron may possess many advantages for industrial and process applications, and has received close scrutiny by the pet industry. Ductile cast iron contains graphite in the form of compact spheroids, tending to have a smaller surface area : vol ratio than the graphite in grey iron, thus providing continuity of metallic surface.

This cast iron may have extensive use in pumps, valves, water and oil lines, structural supports, and bubble trays for fractionating towers. Its mechanical and heated treated properties are given in tabular form. The composition range of ductile irons is also presented. J. W. H.

BOOK REVIEWS

Aramco and world oil. Roy Lebkicher. New York: Russell F. Moore Co. Inc., 1952. Pp. iv + 107. $3.75.

Originally part of a series of handbooks produced for Aramco's U.S. staff working overseas, this volume provides first, a brief survey of the U.S. home oil industry, and then an admirable conspectus of Aramco's operations in Saudi Arabia and of the nature, variety, and scale of exploring for, and exploiting, oil resources in an undeveloped country. The only U.S. oil concern which operates alone in an oil producing country, Aramco has a story to tell which is unique because of the peculiar conditions in Saudi Arabia, a country for centuries virtually closed to the outside world. The present oil areas are remote from the capital and normal centres of population, and this has greatly added to the problems of creating the new oil communities. This book is evidence of the sensibility of Aramco to these problems and of its endeavours to make its U.S. staff in Arabia more conscious of their responsibility for ensuring good relations with their Arabian co-workers. These relations have been made no easier by rapid developments in production and the emergency character of much that had to be done in recent years. The story of the acquisition of the concession in the thirties is also briefly told, and there is an interesting chapter on the exploration phase. Many good photographs on a subject which is notoriously photophobic and a dozen excellent coloured maps and charts add to the technical excellence and interest of the publication. P. M. de V.

Map Interpretation. G. H. Dury. London: Sir Isaac Pitman and Sons, Ltd. Pp. xi + 203. 15*s*.

It is not claimed that all the problems of this subject are covered in this book of just under 200 pages. In fact, the author mainly confines himself to the geographical interpretation of topographical maps at scales of 1 : 63,360 and 1 : 25,000; some such sub-title would be helpful.

The first hundred pages deal with the interpretation of the physical landscape by a well-selected variety of landscape types analysed according to structure, process, and evolution. Some 160 pages are on the features of occupance, rural, urban, and prehistoric. The concluding chapter deals with morphometric analysis, and a final contribution of 16 pages on cartographic interpretation is made by Dr H. C. Brookfield. Useful bibliographies after each chapter give supplementary as well as background reading and are quite short.

Dr Dury's points of interpretation are selected from actual map examples. These are not reproduced in the book, but useful sketch-maps, drawn on principles expounded by the author, are inserted to clarify the major problems discussed.

The overall impression is that this is a good little book, well written and produced, and useful for sixth forms and first year university students. The chapter on morphometric analysis is more specialized, but its inclusion is justified, since the terms and diagrams relating to the quantitative analysis of landforms are being increasingly used to good effect in general descriptions.

Dr Dury does not set out to teach either the elements of map reading or the principles of geomorphology but assumes a sound grounding in both, and the book is less successful where he attempts to condense into tabloid form (no doubt necessary as a teacher's *aide-memoire*) a "short-cut" to landscape recognition. He makes use of Professor Linton's nomenclature for morphological divisions of ascending scale, although his definition of each is not entirely clear.

The necessary condensing of material has not led to over-simplification or over-generalization. No mention is made of the increasing interdependence of aerial photographs and maps, especially at these scales, although five, or possibly six, of the eight plate-illustrations are oblique aerial photographs. Comparison between ground and map may be most convincing, but is not "the only possible corrective" test for detail (p. 2), and at some scales may not prove as helpful as the air photograph.

Coinciding approximately with books by Miss D. Sylvester (Map and Landscape) Messrs F. J. Monkhouse and H. R. Wilkinson (Maps and Diagrams), it appears that a serious attempt is being made by British geographers to provide an adequate and up-to-date set of references on essential geography. E. P.

Gravity Waves. National Bureau of Standards Circular 521. Washington: U.S. Government Printing Office, 1952. Pp. iv + 287. $1.75.

This publication consists of a series of short papers (some in abstract form only) presented at the symposium on Gravity Waves, held as part of the scientific programme of the National Bureau of Standards in 1951.

Interest in waves increased during the late war, and most of the experimental and theoretical work described can be traced back to the problems set by war-time operational requirements. Progress has been made in finding out more about the fundamental principles underlying the early empirical rules. However, there has also been improvement in the kind of information required by the design engineer. The papers on harbours, for example, give methods of calculating the diffraction round breakwaters and the oscillation of the mass of water contained in the harbour; these theoretical methods have been checked by model experiments, using some interesting techniques which are described.

Theoretical studies of sea waves include their propagation from storm areas to calm water and on to beaches. These studies are supported by model work at all stages, including generation of waves by wind and the breaking of waves. The short, rough "sea," as opposed to the more regular swell, has been examined in more detail than before, and some observations at sea have been made. An excellent summary of the methods and uses of the analysis of sea waves is given.

Other subjects include roll-waves, such as occur in sloping aqueducts, oscillations of the earth's atmosphere and measurement of water level in an enclosed basin, this latter leading to a determination of the magnitude of the earth tide.

It is pleasant to note that Vaughan Cornish's "Ocean Waves and Kindred Geophysical Phenomena" is the inspiration for much of the detailed studies of to-day, just as it was the main reference book in the war years. T. F. G.

ADDITIONS TO THE LIBRARY

Proceedings 31st Annual Convention Natural Gasoline Association of America. Tulsa, Okla.; The Association, 1953. Pp. 152.

The full report of the 31st Annual Convention of the NGAA was held at Houston, Texas, in April 1952, and covered most phases of the natural gasoline industry.

Proceedings of the Institution of Mechanical Engineers, Vol. 165, W.E.P. Nos. 63–69, 1951. London: The Institution, 1953. Pp. 282 + vii.

1952 Book of ASTM Standards including Tentatives.

Part 1. Ferrous Metals. Pp. 1572 + xxviii.
Part 2. Non-ferrous metals. Pp. 1327 + xxix.
Part 4. Paint, naval stores, wood, fire tests, sandwich constructions, building constructions. Pp. 1152 + xxvii.
Part 5. Fuels, petroleum, aromatic hydrocarbons, engine antifreezes. Pp. 1253 + xxvi.
Part 6. Rubber, plastics, electrical insulation. Pp. 1488 + xxx.
Part 7. Textiles, soap, water, paper, adhesives, shipping containers. Pp. 1334 + xxviii.

Institute of Physics Monographs for Students. London: Institute of Physics, 1953. *5s.* each.

Practical Thermometry. J. A. Hall. Pp. 51.
The Magnetic Circuit. A. E. De Barr. Pp. 62.
Soft Magnetic Materials Used in Industry. A. E. De Barr. Pp. 62.
Fundamentals of Thermometry. J. A. Hall. Pp. 48.

These are the first of a series of monogrephs which the Institute of Physics has commissioned for "general reading by students in courses for the Higher National Certificate in Applied Physics," and it is also intended that they should "be found useful in the first two years of a degree course."

It is stressed that they are designed for general reading and not to cover any special part of a National Certificate syllabus. Therefore, they should be of use to all interested in the branch of applied physics referred to.

Instrumentation for the Process Industries. Seventh Annual Symposium. Pittsburgh, Pa.: The Instruments Publishing Co., 1953. Pp. 66. $2.00.

The Seventh Annual Symposium on Instrumentation for the Process Industries was held by the Agricultural and Mechanical College of Texas in June 1952 in Houston, Texas. The sessions were devoted mainly to advances in instrumentation and to instrumentation of plants typical of the area. Thus, the petroleum industry receives considerable attention. Papers and discussions included are: "Organization of instrument departments in typical process industries" (S. S. Shaffer, Humble Oil Refining Co.); "Instrumentation for disposal of industrial waste" (J. C. Dobson, The Foxboro Co.); "A university-level course in process engineering" (G. L. Farrar, *Oil Gas J.*); "On-the-job training in instrumentation" (J. A. Parker, Shell Chemical Corpn); "Lube-oil processing and instrumentation" (E. W. Midlam and J. D. Dorsey, Cit-Con Oil Corpn); "Process flow sheets and instrument control diagrams" (W. L. Willoughby, Cities Services).

Prevention and Resolution of Tar Emulsions in High-BTU Oil Gas Production. H. R. Linden and R. Parker. Chicago, Ill.: Institute of Gas Technology, 1953. Pp. 16. $2.50.

A preliminary study of the effects of wetting agents in controlling water content of oil gas tars. It is shown that a relationship exists between water content of stable emulsions of the tars and the interfacial tension between the emulsions and water. A procedure for producing oil gas tars of low water content by adding wetting agents to the circulating liquor is indicated.

Petroleum Facts and Figures. Tenth edition. American Petroleum Institute. New York: API, 1952. Pp. 262. $1.50.

Although containing fewer pages than the 9th edition, published in 1950, this volume provides a mass of useful statistical information relating to the petroleum industry. Primarily intended to cover the U.S.A. industry, there is, however, a useful section giving world statistics including figures for reserves, production, refining, demand, etc.

In general, the statistics cover up to, and including, 1951, with data for several prior years.

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Oilfield Exploration and Exploitation

Geophysics and Geochemical Prospecting

1287. Patents. U.S.P. 2,604,955 (18.4.46; 29.7.52). J. E. Hawkins, assr to Seismograph Service Corpn. System for analysing seismographic records, in which selective filtering of information on the initial record is effected by varying its motion, while the final record is being produced from it.

U.S.P. 2,604,954 (24.1.48; 29.7.52). R. W. Mann, assr to Standard Oil Development Co. In seismic exploration under water, generation of secondary seismic impulses is prevented while generating primary seismic waves, by placing below the surface of the water a charge of explosive and placing at an effective distance from the charge, and below the surface of the water, a mass having an acoustic impedance substantially different from that of water and capable of withstanding disintegrating forces of the charge when fired and of distorting appreciably the normally spherical gas bubble formed in the water by the exploding charge. The bubble does not then collapse towards its centre and the elastic energy thereof is radiated uniformly. V. P. P.

U.S.P. 2,627,727 (22.10.46; 10.2.53). C. F. Sellers, assr to Robt. H. Ray Inc. Apparatus for making geophysical measurements in water covered areas.

U.S.P. 2,627,930 (9.7.48; 10.2.53). J. P. Woods, assr to Atlantic Refining Co. Apparatus for underwater seismic operations.

U.S.P. 2,628,315 (25.11.49; 10.2.53). K. C. Crumrine, assr to Texas Co. Subsurface prospecting, using neutrons and γ-rays. J. M. S.

Drilling

1288. Review-forecast issue. *World Oil*, 15.2.53, **136** (3), 132, 140, 142, 144, 145, 146.—It is significant that, with a decrease in 1952 of number of wells drilled compared with 1951, the footage is greater; more emphasis has been put on deep drilling. Figures were 45,885 wells with 186,399,894 ft in 1952. The average well depth was 4062 ft. 39·9% of total wells drilled for production were dry holes (39·3% in 1951). 3 tables.

The number of rigs in operation was above 5000 for each of the first 6 months of the year. The effects of the steel strike were felt about July, and the conventional trend of the number of rigs operating was therefore reversed, there being a substantial decrease in the latter half of the year. Despite this, a 0·26% gain was recorded over 1951. Again, deeper drilling is evident from the analysis. 2 tables.

The activity of contractors continues to increase, 91% of wells being drilled; footage drilled by contractors has doubled the 1946 figure. 1 table.

Of the wells completed, 22·6% are owned by 22% of the larger companies which are responsible for the production of 60% of the U.S.A. oil.

The use of rotary methods continues to increase, and now stands at 82·5% of the 45,885 wells drilled. 1 table.

Approx 85·2% of the total rigs are owned by contractors (86·5% of rotary and 82·4% of cable tool rigs).

The world record of 20,521 ft set in 1949 by Superior Oil of California in Wyoming remains. Several area records are broken. 2 tables. A. J. H.

1289. Drilling forecast. W. L. Baker and C. V. Smith. *World Oil*, 15.2.53, **136** (3), 129.—The forecast is prepared from an analysis of proposed programmes of numerous oil companies and independent producers. It is estimated that 46,988 new wells will be drilled, of which 22·4% will be wildcats. This represents an increase in total wells drilled of approx 2·3% over 1952, and is expected to be accounted for in regions other than Texas, where a slight decrease is anticipated. The 1952 forecast was in error by only 0·18%. The details are tabulated. A. J. H.

1290. New drilling equipment. C. H. Alcorn. *World Oil*, 15.2.53, **136** (3), 152.—The petroleum industry has the resources to solve most of the problems set it, and may even anticipate 30,000 ft drilling. Tungsten-carbide bits have proved to be the answer to drilling hard formations, and vibration drilling is being studied. Graphite has been used as a mud additive for the lubrication of pump parts and outer surfaces of the drill pipe. Emphasis is laid on careful planning of mud programmes. The new drill-collar joint suggested by the API sub-committee has been promising. Compounding pumps are outstanding in technique development, and make use of automatic relief valves, vibrator hoses, and pulsation dampeners; this has resulted in higher drilling efficiency. A nitrogen impact jar has several advantages over other types; it operates on the principle of gas expansion. Torque indicators have cut down on pipe failures. The co-ordination of all the above and other improvements has been achieved in certain well-designed modern drilling-barges. A. J. H.

1291. Oil base muds. G. Roberti, E. Sommariva, and M. A. Scaramucci. *Riv. Combust.*, March 1953, **7** (3), 111–21.—Oil-base muds, which are emulsions of the water-in-oil type, stabilized by different soaps, show remarkable advantages as to fluid loss and cake thickness.

Muds of 2 types, one with silicate and tall oil, the other with calcium naphthenate, as stabilizing agents, have been prepared, and their behaviour towards weight materials (barite) and contaminating substances has been examined.

The fluid loss has also been measured in a special filter press which allows experiments at high pressure and temp. The results were found to be satisfactory. (Authors' Summary.)

1292. Changing trends in drilling costs. R. L. Binning and B. H. Corey. *Canad. Min. metall. Bull.*, Feb. 1953, **46**, 90–2.—A brief outline is given of the basic factors affecting drilling costs, and the major factors in the trend toward higher costs are discussed. Data are given of the trends in drilling costs for labour, equipment, and miscellaneous items for the years 1941, 1945, and 1947–52, and for drilling costs *vs* rate of penetration for the same years. Distribution costs are shown for a Leduc–Woodbend well and an Edmonton-area wildcat. Average well depths and footage rates are given for several Western Canadian fields. Penetration rates have shown increases which, with greater efficiencies, have allowed the contractor to hold, and even reduce, footage rates compared with 1945 levels, despite other cost increases. Other factors influencing contracting costs are described. Jet drill tests and their possibilities are discussed. W. H. C.

1293. Neutron derived porosity-influence of bore hole diameter. C. B. Scotty and E. F. Egan. *J. Petrol. Tech.*, Aug. 1952, **4** (8), *AIMME Tech. Paper No.* 3377, 203–6.—The induced γ-rays in neutron logging are mainly dependent on hydrogen concentration, and hence it is to be expected that the fluid-filled bore hole will materially affect the logs. Increase in dia will decrease the induced γ-ray component and, if no correction is applied, will affect porosity inferences. The scattered γ-ray component of the log increases with increase in hole dia. Empirical porosity correlation has been developed for 5 hole diameters in the Canyon reef of West Texas. The factors controlling the slope and intercept of the curve have been analysed. The induced γ-ray component fixes the slope, and together with the scattered γ-ray component, gives the intercept. The various curves were transposed so that they intersected the porosity axis at 50% for zero deflection. A plot of the log of the bore hole area (less sonde) against the neutron deflection for a fixed porosity gave a straight line, showing the expected relationship.

Liquid filled neutron–γ porosity correlations for shale-free formations were calculated for the common bore hole sizes. These curves showed the sensitivity of the neutron–γ curve to changes in porosity to decrease with increase with hole dia. Thus, accurate determinations of instrument zero are needed if reasonable estimates of porosity are to be made in large holes.

In large holes, small changes in dia materially influence the log. Porosity interpretation in large holes is further hampered by decrease in the neutron–γ log response to changes in porosity with increase in hole dia. G. D. H.

1294. Patents. U.S.P. 2,605,083 (13.5.46; 29.7.52). S. W. Collins. Well drilling apparatus which provides for removal of cuttings simultaneously with drilling and a bottom hole pressure of any value relative to the formation pressure, but insufficient to stop inflow of formation fluids.

U.S.P. 2,602,635 (3.12.45; 8.7.52). F. J. Young, assr to National Supply Co. Drilling rig of I.C. engine power type, having a plurality of engine assemblies positioned transversely thereof in parallel relation and clutch means mounted between the prime movers, whereby the power unit may be of minimum width.

U.S.P. 2,605,321 (21.6.51; 29.7.52). J. E. Owen, assr to Geophysical Research Corpn. Electrical well logging apparatus using a guard electrode assembly with provision for recording a curve of the spontaneous potentials existing in the immediate vicinity of the exploring electrode, from which the resistivity or conductivity curves are obtained.

U.S.P. 2,604,073 (25.2.48; 22.7.52). P. H. Nast, assr to Worthington Pump and Machinery Corpn. Valve for controlling distribution of operating pressure fluid to the actuated mechanism of a percussive rock drill.

U.S.P. 2,602,642 (26.11.46; 8.7.52). R. C. Baker, assr to Baker Oil Tools Inc. Hydraulic under-reamer designed to avoid erosion of the cutters by the hydraulic fluid and in which the wear in the plunger for expanding the cutters is minimized.

U.S.P. 2,604,304 (7.1.49; 22.7.52). L. F. Wilson. Portable drilling apparatus.

U.S.P. 2,602,636 (27.6.47; 8.7.52). W. J. Travers, assr to Richfield Oil Corpn. Apparatus for drilling exploratory wells below the sea.

U.S.P. 2,604,305 (24.10.46; 22.7.52). J. Livingstone, assr to P. E. Livingstone. Rock drill.

U.S.P. 2,602,638 (27.8.48; 8.7.52). F. M. Slater, assr to Ingersoll-Rand Co. Mounting for rock drills.

U.S.P. 2,602,639 (19.7.48; 8.7.52). G. G. Green. Rock drill bit capable of cutting in both forward and rearward directions.

U.S.P. 2,605,131 (27.2.48; 29.7.52). S. J. E. Marshall and L. M. Wilhoit, assrs to Otis Engineering Corpn. Retrieving tool.

U.S.P. 2,604,365 (17.4.47; 22.7.52). R. H. Howard. Rubber sleeve protector for drill pipes.

U.S.P. 2,604,364 (3.11.49; 22.7.52). W. F. Ward. Sucker rod guide.

U.S.P. 2,605,122 (30.6.47; 29.7.52). J. S. Page, assr to Page Oil Tools Inc. Rod coupler which is releasable upon rotation of the rods through a fraction of a turn without releasing any threaded connections, and consisting of a stem section with a head and a sleeve section with gripping fingers.

U.S.P. 2,602,515 (1.3.48; 8.7.52). R. C. Baker and W. S. Althouse, assrs to Baker Oil Tools Inc. Rotatable casing scraper.

U.S.P. 2,602,512 (12.2.49; 8.7.52). R. C. Baker, assr to Baker Oil Tools Inc. Casing centring device, comprising a cylindrical collar having at each end an inturned flange with circumferentially spaced notches and longitudinally disposed ribs within said collar and notches, the ribs being secured to the collar.

U.S.P. 2,602,516 (2.5.49; 8.7.52). D. P. Gray. Oil sands, etc., are removed from wells by raising a swab in the well, thereby causing inward collapse of loose sands which are washed out of the well by circulating fluid while the swab is being lowered.

U.S.P. 2,603,293 (17.5.50; 15.7.52). J. Lynes, assr to Lynes Inc. Apparatus for cementing a well by confining the cement within an inflatable sleeve.

U.S.P. 2,602,510 (12.1.48; 8.7.52). R. C. Baker, assr to Baker Oil Tools Inc. Ported cementing apparatus.

U.S.P. 2,602,511 (12.1.48; 8.7.52). R. C. Baker, assr to Baker Oil Tools Inc. Apparatus for preventing cement slurry from moving, either internally or externally of the casing, below the cement discharge point, without impeding free up and down movement of the casing string prior to the cementing operation.

U.S.P. 2,602,514 (23.4.49; 8.7.52). W. S. Althouse, assr to Baker Oil Tools Inc. Cement basket including a plurality of leaf springs which are welded on to a supporting member.

U.S.P. 2,604,181 (25.8.48; 22.7.52). R. B. Basham and C. W. Macune, assrs to Westronics Inc. Vibrator of known frequency and a vibration pick-up arranged in spaced relation to each other and in sliding contact with the inner surface of the well casing to be computed for locating frozen, *i.e.*, cemented, areas around the casing. The apparatus is particularly used in recovering casing from abandoned wells.

U.S.P. 2,603,292 (7.1.49; 15.7.52). J. S. Page, assr to Page Oil Tools Inc. Anchor or gripping device useful in wells, including an elongated tubular body carrying longitudinally spaced flanges between which slips are guided for radial movement and carrying circumferentially spaced ribs located between the flanges serving to space the slips apart and guide them for, and at the same time limit, their radial movement.

U.S.P. 2,602,513 (11.3.49; 8.7.52). M. B. Conrad and R. K. Matlack, assrs to Baker Oil Tools Inc. Well packer.

U.S.P. 2,603,295 (7.4.47; 15.7.52). J. D. Whitten. Well packer which can be set from a point on the surface, released and reset, without removing the packer from the well.

U.S.P. 2,604,170 (23.11.49; 22.7.52). L. A. Leffler. An expandable plug is lowered into the bore of a well casing by means of the pipe string, which is then rotated to expand the plug into locking arrangement with the walls of the casing. The pipe casing above the locked plug may be removed by pouring cement on to the plug and fracturing the walls of the casing above the set cement.

U.S.P. 2,603,294 (21.12.45; 15.7.52). C. H. Barnes, assr to Lane-Wells Co. A resilient rubber-like well packing element which, by application of longitudinal pressure thereto, is expanded radially into sealing engagement between the packer and the surrounding casing, and with close ring means provided in association with the packing compression means so as to close the clearance spaces at the end of the packer sleeve element between the packer and surrounding casing, to prevent extrusion of the packing while under pressure.

U.S.P. 2,604,172 (15.4.46; 22.7.52). G. G. Wrightsman, assr to Standard Oil Development Co. Water-wet siliceous formations are consolidated and plugged by introducing a dilute mineral acid and/or stannous chloride to react with part of the solid components and then introducing a fluid mixture of a water-sol aldehyde, a low mol. wt. phenol having <3 carbon atoms in alkyl side chains and a cat comprising stannous chloride to promote resin formation and preferentially wet the formation with the resinous product.

U.S.P. 2,604,903 (23.9.46; 29.7.52). C. R. Neilon, assr to National Supply Co. Blowout preventer *A* of the ram type having a packing element for the ram which may be inserted or removed vertically from the upper portion of the body of *A*.

V. P. P.

U.S.P. 2.627,314 (14.11.49; 3.2.53). R. C. Baker and B. L. Austin, assrs to Baker Oil Tools Inc. Cementing plug and valve device for well casings.

U.S.P. 2,627,315 (9.5.51; 3.2.53). H. C. Hettinger. Well point core.

U.S.P. 2,627,316 (1.7.46; 3.2.53). R. C. Baker, assr to Baker Oil Tools Inc. Well tool swivel device.

U.S.P. 2,627,391 (1.7.50; 3.2.53). R. R. Crookston and W. L. Chappell, assrs to Standard Oil Development Co. Hoisting device for use in an oil derrick.

U.S.P. 2,627,392 (1.10.51; 3.2.53). W. L. Morris, assr to Phillips Petroleum Co. Control circuit for an electric drilling assembly.

U.S.P. 2,627,891 (28.11.50; 10.2.53). P. B. Clark. Pipe expander for expanding collapsed areas of pipe inside a well bore.

U.S.P. 2,627,925 (18.2.50; 10.2.53). B. M. Scivally. Well scraping device.

U.S.P. 2,627,926 (7.9.50; 10.2.53). R. S. Henry. Well boiler.

U.S.P. 2,628,498 (6.5.48; 17.2.53). A. L. Smith. Drilling-rate indicating device.

U.S.P. 2,628,816 (20.8.49; 17.2.53). R. I. Mahan. Core-sampling tool.

U.S.P. 2,628,818 (16.5.49; 17.2.53). T. S. Graham, assr to Phillips Petroleum Co. Well drilling rig.

U.S.P. 2,628,819 (22.11.49; 17.2.53). C. Parsons, assr to Engineering Development Co. Screen arrangement for use with oil well drilling turbines.

U.S.P. 2,628,820 (2.5.50; 17.2.53). E. F. Sheak. Well casing puller.

U.S.P. 2,628,822 (18.11.49; 17.2.53). L. O. Herndon, assr to J. E. Jones. Magnetic plug for core bits.

U.S.P. 2,629,257 (7.5.49; 24.2.53). G. H. Link. Apparatus for measuring the total length of pipe lowered into an oil well.

U.S.P. 2,629,444 (10.11.50; 24.2.53). R. E. O'Donnell. Anchor device for use with a drill stem tester in oil wells.

U.S.P. 2,629,445 (23.11.46; 24.2.53). G. A. Dill, assr to J. C. Kinley. Device for severing pipes in oil wells.

U.S.P. 2,629,446 (14.11.49; 24.2.53). N. N. Freling and H. L. Edwards, assrs to Phillips Petroleum Co. Packing device for sealing off a section of a drill hole.

U.S.P. 2,629,667 (27.12.49; 24.2.53). H. H. Kaveler, assr to Phillips Petroleum Co. Hydraulic cement slurry containing a methyl hydroxyethyl cellulose mixed ether. J. M. S.

Production

1295. Review-forecast issue. *World Oil*, 15.2.53, **136** (3), 183, 192, 194, 200, 204, 208.—The rise in production parallels the increasing domestic demand and, as during 1952, this was accounted for by the four leading producing states, Texas, California, Louisiana, and Oklahoma. The expected production is in the region of 2310 million brl, a rise of 0·97% over 1952. An analysis is given of some of the production in the various states. 3 tables.

Production of natural gasoline in 1952 was 7·2% higher than in the previous year, and 1953 is expected to show an increase of 4·9% over 1952. The overall production during the year is expected to reach 231 million brl. 2 tables.

Actual production of natural gas increased 10% in 1952, and the proved reserves have also increased. According to the production trend in 1952, however, the ratio of reserves : production has decreased from 24·3 to 22·9. 7 tables.

The proved unproduced reserves have been increased to over 34,000 million brl, of which the major part, 29,000 million, is in crude reserves. The increase last year was about 4448 million brl. 3 tables.

Although 10 records were broken, the world record remains 15,530 ft. 2 tables.

With 492,426 producing wells, the increase over 1951 stands at 3·4%. A. J. H.

1296. LPG production; sales to rise. G. R. Benz and P. W. Tucker. *World Oil*, 15.2.53, **136** (3), 212.—A detailed analysis of the production and distribution of LPG showed a sales increase of 6·7%, exclusive of that part used in the manufacture of the synthetic-rubber components. The rate of increase was less than that of 1952. The trend of greater use of ethane over propane and butane in chemical manufacture is expected to continue. Transportation difficulties for ethane have yet to be tackled. The seasonal demand for LPG introduces problems of storage, but it is recommended that a better balance be developed between summer and winter demands; this would have to be on an overall industrial basis. 2 tables. A. J. H.

1297. Artificial lift. J. E. Kastrop. *World Oil*, 15.2.53, **136** (3), 181.—The effect of the steel strike has been felt also in this field. The scarcity of steel resulted in the more conservative drilling programmes and resultant higher proportion of producers. It is anticipated that 21,342 more wells will be put on artificial lift in 1953. A widening of the wildcat programme may result in a large number of dry holes, with corresponding influence on the number of wells using artificial lift. Expenditure on maintenance is expected to be the highest yet. A table gives the distribution in various states and districts. A. J. H.

1298. New production methods. J. A. Perkins. *World Oil*, 15.2.53, **136** (3), 217.—Progress in the industry is not claimed to be spectacular, but nevertheless it has been steady.

Where the reservoir body consists of a much fractured, but light matrix, such as the Spraberry sand, a method of water inhibition has been tried on laboratory cores, and an increase in production from 10% by primary methods to 30% by this method is claimed.

Permanent well completions have been used where the tubing and well-head are not disturbed for completion and remedial work. There is a high reduction in cost; tubing is not pulled, and mud is not required for control purposes, thereby eliminating

failure due to mud blocking. Wireline tools have been developed for use with this type of installation.

A perforating gun has been designed which permits testing of the newly perforated interval immediately after the operation. A 4-way jet gun has been developed for perforating casing at 4 points on the same level. This reduces channelling effects of cement. Minimum number of 4 holes/ft, max of 12 holes/ft.

Multiple fracturing consists in injecting temporary bridging agents into primary fractures, and then repeating the process with a higher pressure. The agents are usually soluble in crude oil.

Infra-sonic waves have been used for production of up to 600 b.d. from wells. The method requires a series of check valves. 2 types of solid interface gas lift systems have been developed, where the interface is provided by expanding bellows and a synthetic rubber ball. In the case of the latter, 2 production strings are necessary. A grooved plastic sucker-rod-guide reduces wear due to eccentricity in the tubing; it is a cylinder grooved to permit free passage of oil.

Separation of light and heavy gases is effected with the use of permeable plastics, permitting passage of, say, methane, restricting hexanes and heavier, or the de-misting of natural gas.

Collapsible rubber tanks are useful for temporary storage of fluids, including water, muds, fuels, and crudes.

Bottom-hole chemical injectors operated by the surface pumps have been used for the injection of approx 40 gal inhibitor/day; they operate on a differential pressure principle.

17 refs. Diagrams. A. J. H.

1299. North Coles Levee field pressure maintenance project. C. A. Davis. *J. Petrol. Tech.*, Aug. 1952, **4** (8), 11–21.—North Coles Levee is a broad east–west elongated dome. Dry gas sands occur in the Etchegoin–Pliocene at 4000 to 5600 ft, but the oil production comes from the Monterey below *ca* 8000 ft, in the Stevens sand. One producing zone wedges out on the flank of the structure. It is poorly sorted and contains large amounts of sand, and within the producing interval there are sands with negligible permeability. The permeabilities are highly variable and range 0 to 7500 mD. Injection of dry gas began in 1942, about 4 years after the field was discovered. The pressure was then above the bubble point, and this state has been maintained. Injection plant capacity has risen from 30 M.M.c.f/day to 75 M.M.c.f/day to deal with the Main Western zone and the 21-1 zone. In the former, most injection has been within the area of the original gas cap, and this has expanded laterally and vertically, with signs of more rapid progress down flank because of higher permeability streaks. The position of the gas–oil surface has been found by periodical temp surveys. This has permitted control and the use of remedial work where needed, thereby conserving energy.

Details of the drilling and completion practices are given, as well as of the development and use of the temp surveys and remedial work.

It is believed that after the gas–oil contact has nearly reached the oil–water contact gas cycling may be used. Pressure depletion subsequently will allow some oil to come from low permeability sands, and finally the reservoir may be used for gas storage to balance out seasonal demands. Without pressure maintenance, recovery might have been under 100 brl/acre/ft. Twice this amount, and possibly more, may be expected. The gas has also appreciated in value. Much of the cost of pumping equipment has been avoided.

On 1 Oct. 1951 recovery was 59,600,000 brl, the cumulative gross G.O.R. being 1915 cu. ft/brl. 116,725,000 M.c.f. of gas had been injected. The solution G.O.R. averaged about 600 cu. ft/brl. G. D. H.

1300. Laboratory determination of relative permeability. J. G. Richardson, J. K. Kerver, J. A. Hafford, and J. S. Osoba. *J. Petrol. Tech.*, Aug. 1952, **4** (8), *AIMME. Tech. Paper No.* 3375, 187–96.—A detailed study has been made of several methods of making relative permeability measurements to select those most suitable for routine core analysis. Work is described which permits the influence of the boundary effect to be predicted from theoretical studies. The gas relative permeability is the only

one in a gas–oil system affected by the boundary effect, and even there the error can be reduced by increasing the rate of flow.

The effects of a several-fold expansion of gas along a core in gas–oil flow have been investigated. This causes a saturation gradient, but the errors in the relative permeability measurements are small.

The drainage relative permeability-saturation relationships have been found to be independent of the rate of flow fluid, so long as the rates do not involve important inertial effects.

It is concluded that the Hafford, Penn. State, Hassler, and dispersed feed methods give the correct relative permeabilities to oil and gas. These methods require about a day to define the curve for cores of over 100 mD permeability. The gas drive method requires about 2 hr per core, but the present technique of calculating oil permeabilities from the observations is not adequate. G. D. H.

1301. Principles of core analysis. J. A. Klotz. *J. Petrol. Tech.*, Aug. 1952, **4** (8), 28.—Core analysis began about 25 years ago. Porosity is most often measured, the Kobe porosimeter being widely used. Overburden pressure may cause the rock in place to have a lower porosity than is measured, especially in shaly or poorly consolidated sands. Some high porosities have been attributed to removing overburden or to tension on fold crests. Permeability is a function of the fluid used and also may be affected by overburden; cracks may appear in preparing cores for test; oil saturation measurements may not be those of the rock in place, but will lie between the virgin reservoir saturation and the saturation of a water-flooded sand.

Oil gravity measurements on core material are difficult, the various techniques having different limitations. The restored state technique seems best for obtaining interstitial water saturation. Flood pot testing is used to assess suitability for water flooding. G. D. H.

1302. Errors in calculation of gas injection performance from laboratory data. F. F. Craig. *J. Petrol. Tech.*, Aug. 1952, **4** (8), 23–4.—In some measurements of gas–oil relative permeability it has been wrongly assumed that the relative permeability is proportional to the product of the rate and the viscosity, thereby ignoring the existence of a saturation gradient. In attempts to remove this error a factor to allow for oil velocity gradient has been used, but this also is inadequate. Welge has employed a method of finding the saturation at the outlet end, and, in terms of this, the relative permeability ratio is given by the simple assumption mentioned above. Laboratory tests on Nellie Bly sandstone, using external gas drives with fluids of viscosities 1·4, 9·8, and 125 cp under identical pressure differentials, have confirmed the correctness of Welge's approach when gas expansion and outlet boundary effects were kept small.

Field performance was calculated by the various methods for linear and radial drives. Depending on the method used, the field performances predicted showed differences ranging up to 7 to 1. Care is therefore needed in selecting the correct combination of relative permeability ratios and field calculations, allowing for saturation gradients. G. H. D.

1303. Patents. U.S.P. 2,602,331 (22.9.47; 8.7.52). J. A. Moosman, assr to Johnston Testers. Fluid pressure recorder for oil wells, having an outer housing within which a recording chart is supported and driven by clockwork mechanism, the chart operating in conjunction with a stylus which is moved by direct mechanical operation in response to pressure of fluid confined within the recording instrument, the device being fitted with a fluid responsive means for operating the stylus which does not require the use of packing and will operate uniformly and accurately.

U.S.P. 2,604,169 (7.2.48; 22.7.52). I. A. Miller. Well treating and flow controlling device.

U.S.P. 2,604,168 (13.2.47; 22.7.52). P. M. van Ackeren. Frostproof deep well pump arrangement.

U.S.P. 2,604,947 (22.11.46; 29.7.52). D. Martin, assr to Hercules Powder Co. Secondary oil recovery from wells by selective plugging of permeable strata with an emulsion of a resin obtained as a by-product in the recovery of rosin from pine-wood

having a gasoline insolubility of 30 to 95% unsaponifiable content 5 to 20%, mp >85° C, acid No. >140, which forms a hard plug in the oil sand and is easily removable with alkali.

U.S.P. 2,603,296 (20.6.49; 15.7.52). A. C. Russell. Steam and oil are intimately mixed in a tank and the mixture used for treating oil wells. V. P. P.

U.S.P. 2,627,317 (9.12.47; 3.2.53). R. C. Baker, assr to Baker Oil Tools Inc. Well tester.

U.S.P. 2,628,562 (30.8.48; 17.2.53). C. J. Coberley, assr to Dresser Equipment Co. Fluid operated pump with tandem booster pumps.

U.S.P. 2,628,563 (21.2.49; 17.2.53). C. J. Coberley, assr to Dresser Equipment Co. Fluid operated pump with double-acting direct-connected booster pump.

U.S.P. 2,628,565 (12.9.46; 17.2.53). W. C. Richardson. Reciprocating pump for oil wells.

U.S.P. 2,628,682 (23.9.47; 17.2.53). K. A. Wright. Centering and well cleaning tool.

U.S.P. 2,629,329 (4.10.46; 24.2.53). H. E. Rose, F. M. MacDougall, and R. W. Schoen, assrs to Alco Valve Co. Deep well pump.

U.S.P. 2,629,335 (17.10.46; 24.2.53). C. M. Peters, assr to Garrett Oil Tools Inc. Gas lift valve system for oil wells.

U.S.P. 2,629,447 (15.12.49; 24.2.53). R. Nebolsine. Method of controlling the recharge of underground formations by special wells. J. M. S.

Transport and Storage

1304. Some considerations concerning tanker propulsion. R. Gasquet. *Bull. Ass. franç. Tech. Pétrole*, 1953 (97), 7–11.—Preferred design is single screw with max rpm (up to 15,000 h.p., adequate for 40,000 dwt ton at 14 knots) of 120. Diesel engines are now available with up to 1200 h.p./cyl (14,400 h.p. for 12 cyl engine) and fuel consumption as low as 160 g/h.p./hr. Turbine driven vessels can utilise steam up to 50 kg and 450° C, min fuel consumption is 260 g/h.p./hr. Diesel is generally used up to 8000 h.p. turbine above 12,000 h.p., with intermediate range current for both types. Fuel cost is decisive factor affecting choice. V. B.

1305. U.S. pipelines. D. M. Taylor. *World Oil*, 15.2.53, **136** (3), 235.—Anticipated pipelines projected should account for 13,910 miles of new pipe in 1953. The division will be: 4050 miles of crude lines, 7100 miles of natural gas lines, and 2760 miles of product lines. Some of this was actually planned for 1952, but was delayed by the steel strike. Table. A. J. H.

1306. Diesel engines in pipeline pumping service. H. Paton. *Engng J., Montreal*, March 1953, **36**, 213–19.—An account is given of the experience gained in the selection, manufacture, and initial operation of Canadian-built diesel engines employed at the pumping stations of the Interprovincial Pipe Line Co. The line is 1130 miles long, connecting Edmonton, Alberta, with Superior, Wisconsin, U.S.A. The design of the pipeline is briefly discussed, and the engines, gearing, centrifugal pumps, crude oil purifying unit, turbochargers, heat exchangers, preheaters, and station layout, are described. The hook-up of the engines for dual fuel operation on either crude oil or natural gas and the advantages of, and precautions necessary in, each case are described. W. H. C.

1307. Patents. U.S.P. 2,602,300 (13.7.50; 8.7.52). S. V. Collins. Apparatus for laying and retrieving pipelines across a body of water.

U.S.P. 2,603,384 (1.5.48; 15.7.52). J. E. Wieschel, assr to Heil Co. Hose reel installation for a tank truck constructed to provide for selective delivery from either side or from the rear of the tank vehicle.

U.S.P. 2,603,382 (15.9.48; 15.7.52). J. J. Kojan, assr to Drum Parts Inc. A ring clamp for fastening a cover on to a metal drum, which affords sealing pressure along the whole perimeter of the drum, comprising a split ring of C-shaped cross-section, one end of which has a radially offset portion of similar cross-section overlapping the other end *B* of the ring and adapted to slide on *B* as the ring is contracted, *B* having a similar offset portion beyond the overlapping portion. Means for contracting the ring are carried on the offset portions. V. P. P.

U.S.P. 2,627,418 (8.5.50; 3.2.53). F. H. Ainsworth, assr to Wayne Pump Co. Flow control nozzle for gasoline dispensers.

U.S.P. 2,628,493 (3.4.50; 17.2.53). L. H. Sandefur. Means for calibrating liq level measuring sticks.

U.S.P. 2,629,366 (3.2.49; 24.2.53). J. F. Seevers. Booster heater for bitumen tank cars. J. M. S.

Refinery Operations

Refineries and Auxiliary Refinery Plant

1308. Report of O.E.E.C. Technical Assistance Mission on Petroleum Equipment. Anon. *Petrol. Times*, 3.4.53, **57** (1452), 280.—This is a summary of observations and recommendations, lists of works visited, and description of the rôle of manufacturing companies and methods of working. G. A. C.

1309. Inspection of refinery equipment. E. J. M. Tait. *Inst. Petrol. Rev.*, 1953, **7** (75), 97.—Protection and inspection of refinery equipment are considered under 4 main heads: vessel liners; process piping, valves, and fittings; heat exchangers; and miscellaneous. Vessel liners for protection against corrosion are either of alloy or gunnite. Alloy liners, either shop-installed or field-installed, usually contain 11 to 14% chrome material. Gunnite liners comprise 1 part of lumnite cement and 3 parts of aggregate retained by a hexagon steel grating welded to the wall of the vessel. Process piping is generally made to comply with the American Code. This is one of the most important pieces of equipment, and the methods used are described in detail. Valves and fittings do not normally give much trouble, apart from the usual wear and tear. Heat exchangers are extremely important in refinery operation, as a factor of economy. The different types used and the method of protection are described. The final section includes pumps, pressure gauges, and pyrometer wells. R. H.

1310. Electrical installations in refineries. L. M. Goldsmith. *Petrol. Process.*, 1953, **8** (4), 527–8.—The total use of electricity in the refining industry has gone up nearly 4000% since 1918. 35 years ago a petroleum refinery used 1 kW.hr/brl of crude oil; to-day is uses upwards of 5 kW.hr/brl.

To bring about the highest economy of electrical installations in a refinery, the equipment used should be standardized as far as possible. Recommendations and suggestions from the National Electrical Codes will help to bring this about. The potential usage of electricity in the refinery is far greater than imagined. J. W. H.

1311. Refining in Mexico. Pt. 3. How Pemex operates a refinery. D. P. Thornton, *Ed. Petrol. Process.*, 1953, **8** (4), 544–9.—The refinery at Atzcapotzalco near Mexico City, with present facilities of 52,000 b.d., carries on the most extensive processing operations of Pemex. The refinery is modern, the newest addition being a 12,000-b.d. Perco cat desulphurization unit, and is almost fully electrified. Steam needs have been kept as low as possible to conserve all fuel oils for sale to industry. The plant fuel is natural gas from Poza-Rica, the crude for the refinery being also obtained from here.

Two interesting features of the Pemex refinery are the light ends fractionating unit, which splits butanes, pentanes, and hexanes from unstabilized straight run gasoline, and the HF alkylation unit, rated to produce 813 b.d. of light alkylate. Because of the lack of refining equipment manufacturers in Mexico, advance planning of maintenance work is of extreme importance to allow time for shipment of materials.

The general practice is to keep on hand all necessary supplies for at least 3 months ahead.

Although the specifications for most of the refined products from Atzcapotzalco follow the requirements in the U.S. (these are given in tabular form), the alkylate concn in Mexican avgas is higher than in the U.S., due to the lack of aromatics in the base stock. For internal protection, Pemex maintains a quality control organization separate from any other operation. J. W. H.

1312. Using radioactivity in the refinery. G. C. Gester, R. D. Lee, and D. E. Hull. *Petrol. Process.*, 1953, **8** (4), 551–2.—Radioactive tracer techniques have found increasing applications in the pet industry. This article describes the use of tracers to study the flow characteristics across the trays of a large vac dist column.

The bubble cap trays in the column are designed for half cross flow with liq flowing toward centre downcomers on odd numbered trays, and toward peripheral downcomers on even numbered trays. The tracer used was cobalt −60 in the form of cobalt naphthenate, $\frac{7}{10}$ of a millicurie of which was dissolved in 1 litre of gas oil. This soln was injected into the column on the tray below the heavy gas oil draw-off by atmospheric press. By means of Geiger counters, the flow of gas oil was traced from tray to tray. Full scale tests were carried with 60-day antimony in the form of triphenylstibine.

From these tests, it was concluded that the liquid flow in the column was not uniform over the trays. The column was therefore shut down, and corrective measures were taken to distribute the liq flow evenly over the trays. J. W. H.

1313. Fluidized solids. M. Sittig. *Chem. Engng*, 1953, **60** (5), 219–31.—A general review of the relative merits of fluidized solids plant, supplemented by a survey of the variety of applications associated with fluidized solids technique. D. M.

1314. How to design compressor accessories. L. J. Murphy. *Petrol. Refin.*, 1953, **32** (3), 137–40.—A full account is given of the types, uses, and methods of fitting air filters, intake piping, intercoolers, aftercoolers, and air receivers, and of the selection of cooling water. R. D. S.

1315. Gas turbine driven centrifugal compressors. W. H. Miller. *Oil Gas J.*, 27.4.53, **51** (51), 244.—A description is given of 5 stations utilizing gas-driven centrifugal units, now in operation in the Southern Division of El Paso Natural Gas Co.'s lines from New Mexico to the Arizona–California border. Eventually, 28 gas turbine units will be installed to handle over 1200 million cu. ft/day. G. A. C.

1316. How to repair units during operation. R. W. Mecklin, L. A. White, and W. J. Buxton. *Petrol. Refin.*, 1953, **32** (3), 133–6. (*A.S.M.E. Kansas City, Sept.* 1952.)—Outlines methods used to repair vessels, heat-exchangers, furnaces, pumps, piping, and compressors during operation, and gives some maintenance hints to reduce the frequency of equipment failures. R. D. S.

1317. Water softener and conditioning problems. D. H. Caldwell and W. B. Lawrence. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 535–48.—Fundamental theory involved in water softening is described and used to construct water conditioning diagrams. Diagrams are compared with published experimental data, their use being illustrated by the solution of typical problems. E. J. C.

1318. Mixing. I. H. Rushton. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 93–5.—Review covering 17 refs. E. J. C.

1319. Size reduction. L. T. Work. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 95–8.—Review covering 109 refs. E. J. C.

1320. Filtration. S. A. Miller. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 68–73.—Review covering 221 refs. E. J. C.

1321. Fluid dynamics. M. Weintraub and M. Leva. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 74–82.—Review covering 299 refs. E. J. C.

1322. Ion exchange. R. Kurin and F. X. McGarvey. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 83–8.—Review covering 413 refs. E. J. C.

1323. Materials handlings. R. L. Speaker. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 88–92.—Review covering 55 refs. E. J. C.

1324. Drying. W. R. Marshall. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 47–54.—Review covering 232 refs. E. J. C.

1325. Evaporation. W. L. Badger. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 55–8.—Review covering 61 refs. E. J. C.

1326. Centrifugation. J. O. Maloney. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 31–3.—Review covering 63 refs. E. J. C.

1327. Crystallization. C. S. Grove, Jr. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 34–8.—Review covering 111 refs. E. J. C.

1328. On the maximum numerical value of the tangential stress in thick-walled cylinders. T. Ranov and F. R. Park. *J. appl. Mech.*, 1953, **20**, 134.—It is implied in literature that the numerical value of the circumferential stress in thick-walled cyl is always a max at the inner radius. This is correct in the case of zero external pressure, but, if both internal and external pressures exist, then there is a possibility of a numerically larger tangential stress occurring at the other radius. This possibility is investigated, and an expression is derived from which the position of the max numerical tangential stress may be determined. A chart is also given to enable this value to be conveniently determined. L. G. H.

1329. To help you design fractionators. Pt 2. R. R. White. *Petrol. Process.*, 1953, **8** (4), 539–43.—This article completes the discussion of stage calculations at finite reboil and reflux ratios (see Pt 1), and considers the cases which arise when other methods of specifying the separation are employed.

The general characteristics of stripping columns with ternary mixtures are summarized. The overhead vapour composition and bottoms product composition are both functions of the re-boil ratio. The value of the minimum re-boil ratio is a function of the specified separation and the manner in which the separation takes place. The composition of liq and vapour in the zone of constant composition at minimum re-boil ratio is a function only of the feed properties.

An example problem is again presented to illustrate the points under discussion. J. W. H.

1330. Steels deterioration is studied. Anon. *Petrol. Process.*, 1953, **8** (4), 530–1.—A study of 125 samples of metal from refiners' processing vessels and piping after long service at high temp, have been examined at the Battelle Memorial Institute, Ohio, under the auspices of the API. The analysis of the specimens includes the investigation of micro-structure, and chemical and physical properties, together with other tests normally employed with metals.

Although no results are yet published concerning the samples, the goal of the programme is to provide U.S. refiners with information on the types of steel to select for certain operating conditions and the minimization of temp effects by the correct construction of vessels. J. W. H.

1331. Maintenance of centrifugal pumps—3. F. B. Applegate. *Oil Gas J.*, 13.4.53, **51** (49), 139.—This part of the Engineering Reference Section deals with the keeping of maintenance records, and gives a list of 15 items to check before starting a pump. G. A. C.

1332. Gasoline plant design. Pt 9. Expansion and flexibility. O. L. Lewis. *Petrol. Engr*, Jan. 1953, **25** (1), C20–6.—Expansion forces are critical primarily at the ends of lines. Methods of controlling end forces are outlined. Typical moment diagrams for

different piping arrangements are given, which may be used as aids to the location of control joints and valves. Methods of calculation for piping design are dealt with, emphasis being placed on good assumptions and judgment. G. H. G.

1333. Compressor calculations. R. W. Brooks. *Oil Gas J.*, 20.4.53, **51** (50), 163; 27.4.53, **51** (51), 217.—Specific heat and related data are given for natural gas mixtures within the operating range of pipeline service, for compressor plant computation.

The following part of the Engineering Reference Section deals with specific heat data for hydrocarbons, equations and charts being given. G. A. C.

1334. Design of cooler condensers for vapour–gas mixtures—II. G. H. Bras. *Chem. Engng*, 1953, **60** (5), 238–40.—The application of the new general method of design for cooler condensers given in *Chem. Engng* for Apr. is outlined for a typical design problem. D. M.

1335. Thermal stresses in piping systems. Pt I. W. E. Wilbur. *Petrol. Refin.*, 1953, **32** (3), 143–8.—The first part of a 3-pt series adapted from the design handbook used by the author's company. Pt I covers expansion of piping, moduli of elasticity, the elastic centre, thrusts, and the flexibility of bends. It includes several useful tables and examples. R. D. S.

1336. Heating tube failures. J. J. B. Rutherford. *Oil Gas J.*, 13.4.53, **51** (49), 145; 20.4.53, **51** (50), 165.—Pt 6 of this series in the Refiner's Notebook deals with tube failures from chemical causes, the major factor being oxidn at elevated temp.

In the final instalment, failures due to chemical causes other than oxidn, as well as metallurgical causes of failure, are discussed. G. A. C.

1337. Heat transfer. B. E. Lauer. *Oil Gas J.*, 13.4.53, **51** (49), 149; 20.4.53, **51** (50), 164; 27.4.53, **51** (51), 296.—Pt 30 of this series continues with coeff of heat transfer through film between outside surface of a cool tube and hot liq.

Pt 31 deals with coeff of heat transfer through film between outside surface of a cool tube, a warm liq, and condensing vapour.

The next part concerns coeff of heat transfer through film between outside surface of a warm tube and a cool liquid. G. A. C.

1338. Heat exchanger costs to-day. F. L. Rubin. *Chem. Engng*, 1953, **60** (5), 201–6.—The first of a series of articles dealing with the factors influencing the selection of a unit, and the ultimate evaluation of the cost of units from specially compiled cost curves, based upon physical data. D. M.

1339. Economics of the air-cooled heat exchanger. J. C. Chase and H. E. Degler. *Petrol. Engr*, Jan. 1953, **25** (1), C42.—These units are particularly adaptable where high level heat removal is desired (25° to 50° F above max air temp), where water is scarce or expensive to treat, or where low operation and maintenance costs are of particular signficance.

An air heat exchanger is a device for cooling fluids by circulating them through finned tubes, and passing atmospheric air across the finned tube sections. A list of the varied applications of the air-cooled heat exchanger is given.

The advantages and disadvantages of induced and forced draught types are listed from design viewpoint. Details of design are given which affect the cost, comparisons being made between air-cooled heat exchangers and the water cooling tower, from both the installation and operation viewpoint. As the temp of the hot fluid rises, the cost of a dry air-cooling unit decreases relative to that of a cooling tower for the same service. A discussion of the advantages of air as a direct cooling medium, types of air-cooled heat exchangers, development and application, design, air temp, and power requirements is included. G. H. G.

1340. Patents. U.S.P. 2,603,388 (17.7.47; 15.7.52). E. E. Bryant, assr to U.S.A. (Secretary of War). Rotary discharge element for hoppers, having helical pockets and an axially slidable shield for adjustably occluding said pockets, whereby varying rates of feed may be obtained without changing the r.p.m. of the rotary element.

U.S.P. 2,602,549 (2.10.45; 8.7.52). C. L. Peterson, assr to Peterson Filters and Engineering Co. Filtering apparatus designed to prevent clogging with slimes.
V. P. P.

Distillation

1341. High temperature distillation. T. J. Walsh. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 39–43.—Review covering 140 refs. E. J. C.

1342. High vacuum distillation. K. Hickman. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 44–6.—Review covering 48 refs. E. J. C.

1343. Spiral flow for better distillation. Anon. *Petrol. Process.*, 1953, **8** (4), 556–9.—The use of the new Kittel contact plate system is reviewed for dist processes, gas scrubbing, direct cooling, degasification, and the separation of heavy hydrocarbon residues into special components. The perforations in the plate are carefully and uniformly calibrated, and the openings are tangentially inclined to produce a combination of centrifugal and centripetal movement of the counterflowing liq and vapours. Thus, no downcomers are required, and the quantity of liq on one particular plate is kept to a minimum.

The plates themselves are made up from triangular zones or segments, and by arrangement of these segments their inclined openings are so directed that the liq can be directed to the periphery of the contact plate or towards its centre by the kinetic effect of the ascending vapours. The principal advantage of the Kittel tray is that the plates are assembled from standard triangular segments, permitting greater convenience in installation.

Details of the perforations for particular operating conditions are not disclosed, but photographs and sectional views of the expanded metal used for this contact plate are given. J. W. H.

1344. A direct nomographic method for solving flash equilibrium equations. P. M. Reilly. *Petrol. Refin.*, 1953, **32** (3), 119–22.—Two nomograms are presented for the solution of flash vaporization equations for multi-component mixtures. Direct reading gives sufficient accuracy for most purposes, but a correction is given if greater accuracy is required. Only a brief account of the theory is given, as a complete treatment was given in an earlier article (*cf* Abs. 2672, 1951). R. D. S.

1345. Vapour–liquid equilibria for ethyl alcohol binary systems. L. R. Hellwig and M. Van Winkle. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 624–9.—Data reported on binary systems of ethyl alcohol with *n*-butanol, *sec*-butanol, *n*-pentanol, acetone, M.E.K., and methyl *n*-propyl ketone at 760 mm. E. J. C.

1346. Patents. U.S.P. 2,602,652 (6.7.48; 8.7.52). C. L. Haynes, assr to C. F. Braun and Co. Bubble cap and riser assembly having an improved form of hold-down yoke which serves to centre the bubble cap on the riser.

U.S.P. 2,602,645 (9.4.48; 8.7.52). R. F. Benenati and H. F. Buschow, assrs to Hydrocarbon Research Inc. Regenerators for recovering the cold content of the outgoing oxygen and nitrogen products of rectification at *ca* −280° F from liquefaction of air. The regenerator packing is produced from long strips of high heat-conducting material, such as aluminium or copper, having one side flat and the other provided with integral ribs or projections, and provided with a brazing coating, *e.g.*, of solder. The strips are wound on a support, the ends being spot brazed to it, and the whole is then heated and cooled to bond the surfaces in contact by melting of the brazing coating. V. P. P.

U.S.P. 2,627,397 (8.8.49; 3.2.53). H. V. Hendrix, assr to Phillips Petroleum Co. Bubble cap assembly for fractionating apparatus.

U.S.P. 2,627,731 (18.6.49; 10.2.53). M. Benedict, assr to Hydrocarbon Research Inc. Rectification of gaseous mixtures.

U.S.P. 2,628,934 (14.1.50; 17.2.53). J. H. Raley, W. E. Vaughan, and L. M. Porter, assrs to Shell Development Co. Hydrogen halides are separated from olefinically unsaturated compounds by fractionation in the presence of an amine or hydrogen halide salt thereof.

U.S.P. 2,629,239 (26.8.49; 24.2.53). J. E. Gautt, assr to Universal Oil Products Co. Separation of closely boiling fractions from a binary mixture by fractionating in the presence of a cold reflux stream of the lower boiling fraction (I). I is withdrawn from the fractionation zone, compressed, passed in indirect heat exchange with the liq phase in the lower portion of the fractionation zone, expanded, separated into liq and gas, and one portion of the liq is used as the reflux stream and another is used to cool the original mixture. J. M. S.

Ger.P. 861,990, 13.11.52. M. R. Fastenrath. Dist installation operated by electricity or gas.

Ger.P. 861,991, 13.11.52. H. Haltmeier, assr to Farbenfabriken Bayer. Installation for liq evaporation.

Ger.P. 861,541, 13.11.52. H. Crotogino. Installation for liq evaporation and/or fractionation.

Ger.P. 860,944, 6.11.52. W. Grimme, E. Koch, and R. Avenarius, assrs to Steinkohlenbergwerk Rheinpreussen and Geb. Avenarius. Dissociation of liq mixtures by dist and decantation.

Ger.P. 861,544, 13.11.52. W. Jappelhoff, assr to H. Koppers G.m.b.H. Column apparatus.

Ger.P. 861,546, 13.11.52. F. Werner. Dist apparatus.

Ger.P. 861,992, 13.11.52. V. Bayerl, assr to Bamag-Meguin A.G. Procedure for regulating the cut of continuous fractionation columns.

Ger.P. 861,691, 13.11.52. R. Christiansen. Extraction apparatus.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 867,993, 8.1.53. A. Hagemann, assr to Ruhrchemie A.G. Process for separating alcohols from alcohol hydrocarbon mixtures.

Ger.P. 864,720, 11.12.52. A. Dönicke. Continuous elec evaporator, *e.g.*, for dist of temp–sensitive oil mixtures.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 868,896, 22.1.53. Deutsche Hydrier-Werke A.G. Process for separating mixtures of high-mol alcohols and hydrocarbons.
BrennstChemie, 1953, **34** (3–4). R. T.

Absorption and Adsorption

1347. Absorption and humidification. R. L. Pigford. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 19–23.—Review covering 41 refs. E. J. C.

1348. Adsorbtion. B. L. Harris. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 24–30.—Review covering 266 refs. E. J. C.

1349. Dehydration of natural gas and light hydrocarbon liquids. Pt VI. The use of adsorption and distillation to dry liquids. J. M. Campbell and L. L. Laurence. *Petrol. Refin.*, 1953, **32** (3), 151–6.—In the last pt of the series a comparison of the dry dessicant and dist methods of drying liq is made using flow-sheets and design data. Standard methods of testing water content are also listed. R. D. S.

1350. Patents. U.S.P. 2,603,305 (13.12.48; 15.7.32). K. H. Hachmuth, assr to Phillips Petroleum Co. Centrifugal apparatus for countercurrent gas absorption.

U.S.P. 2,605,236 (11.7.50; 29.7.52). H. C. McCants, assr to Penn-Dixie Cement Corpn. Preparation of an adsorbent by carbonating cement kiln flue dust, then hydrating and pelleting it (8 to 100 mesh; water content 6 to 17 wt %).

U.S.P. 2,603,310 (12.7.48; 15.7.52). F. E. Gilmore, assr to Phillips Petroleum Co. Separating the constituents of natural gas by cooling to condense components of higher b.p. than methane, contacting the residue gas with a cold absorbent liq (ethane) *A* to absorb preferentially methane, and thereby separate it from nitrogen or other waste gases, the rich *A* then being fractionated.

U.S.P. 2,603,553 (21.4.49; 15.7.52). C. H. O. Berg, assr to Union Oil Co. of California. Separation of a gaseous mixture having constituents of greatest *A*, intermediate *B*, and least *C* adsorbability, at least 2 constituents having the same degree of adsorbability, one of which *D* is extractable, by contacting the mixture with a first moving bed of solid granular adsorbent *S* to remove *A*, leaving *B* and *C*, and contacting the residue with a second moving bed of *S* to remove *B* and leave *C*. *B* is then desorbed by contacting with a reflux gas containing *A* obtained by desorbing both beds of *S* and *D* is extracted from ≮1 product gas with a solvent.

U.S.P. 2,603,306 (14.2.49; 15.7.52). C. H. O. Berg, assr to Union Oil Co. of California. Separation of hydrocarbon gases of 1 to 4 carbon atoms by contacting the gaseous mixture with solid granular adsorbent in 2 successive moving beds *A* and *B*. In *A*, C_3 and higher mol. wt. compounds are absorbed. In *B*, C_3 hydrocarbons are absorbed. C_3 hydrocarbons are desorbed from *A* and a portion used to desorb the C_3 hydrocarbons. Apparatus is also claimed. V. P. P.

U.S.P. 2,627,497 (2.1.48; 3.2.53). S. P. Robinson, assr to Phillips Petroleum Co. Pebble heater apparatus for transferring heat to an absorption zone.

U.S.P. 2,629,460 (4.3.46; 24.2.53). C. J. Maki, assr to Phillips Petroleum Co. Gases are dehydrated by separating into a major stream (I) and a minor stream (II), reducing the pressure of I ⩾ that of the cooled regeneration effluent gas described below, and varying this pressure reduction in conjunction with the rate of flow of II to maintain said rate constant, heating II and passing it through a bed of wet solid granular adsorbent to regenerate said absorbent, cooling the regeneration effluent gas and removing condensed water therefrom, mixing I at the reduced pressure with the cooled regeneration effluent gas and passing it through the bed of adsorbent. J. M. S.

Ger.P. 862,151, 20.11.52. W. Rottig, assr to Ruhrchemie A.G. Process for separating compounds containing oxygen, *e.g.*, carboxylic acids from products of cat CO hydrogenation.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 867,391, 8.1.53. E. Broich, A. Schöllig, and S. Stadelmann, assrs to Bad. Anilin- & Soda-Fabr. Process for separating mono- and diolefins.

Ger.P. 864,431, 11.12.52. J. Schmidt, assr to Carl Still. Use of a bubble cap column for scrubbing ammonia and H_2S from coal dist gases.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 869,040, 22.1.53. O. Fuchs, assr to Farbwerke Höchst. Process for separating oxygen from gases and vapours.

Ger.P. 869,042, 22.1.53. G. Brinkmann, assr to Farbenfabriken Bayer. Process for oxygen absorption.

Ger.P. 869,043, 22.1.53. G. Fischer and H. Biederbeck, assrs to Ruhrchemie A.G. Process for separating CO_2 from gases with lime.
BrennstChemie, 1953, **34** (3–4). R. T.

Solvent Extraction and Dewaxing

1351. Hydrofluoric acid extraction of oxygen-containing organic compounds from mixtures thereof with hydrocarbons. J. Oertel. *Erdöl u. Kohle*, 1953, **6**, 136–41.—Primary alcohols are the main oxygen-containing compounds present in synthesis products obtained by hydrogenation of CO; small quantities of acids and esters can be removed by neutralization and saponification. Preliminary solubility tests were made with anhydrous HF and higher alcohols (after these had been chromatographically purified to remove turbidity-causing hydrocarbon impurities); alcohols up to C_{11} (liquid at 19·5° C, b.p. of HF) are completely miscible with HF, solubility curves (showing high temp coeff) are given for C_{12}–C_{16} alcohols, above C_{16} solubility is very

small. Traces of water have negative effect (increasing with mol. wt. of alc) on alc solubility. Addition of a lower alc (C_4–C_{15}) improves solubility of higher (C_{16}). HF attacks alcohols slowly (no significant effect in 2 hr) but polymerizes olefins, as shown by tests with cetene. Tests on synthesis plant mixture gave satisfactory results with technical HF using mixture : HF wt ratio *ca* 1 : 1·8 at room temp. In case of wide Fischer–Tropsch fraction (b.p. 40° to 360° C), material boiling <110° C should be preliminarily removed, treatment of the solid residue is facilitated by use of hexane as solvent therefor. HF is easily eliminated from raffinate, but its removal from extract requires fractional dist under vac. Treatment of narrow boiling range fractions is preferable, as this enables optimum separation conditions to be utilized. Olefin polymerization can be a disadvantage of the process. V. B.

1352. Selective extraction of cracked gas oils. H. Franz, H. Langner, and H. Westerhoff. *Erdöl u. Kohle*, 1953, **6**, 142–5.—Feed was two samples of similar gas oils having d_4^{20} 0·850 to 0·861, S *ca* 0·75%, aromatics + olefins 45%, b.p. 178° to 270° C, cetane No. 30 to 33. SO_2 extraction alone (even at minimum conditions, 30% SO_2, −30° C) gave, owing to solubilizing effect of aromatics and olefins, a poor yield (*ca* 50%) of raffinate having a quality (cetane No. >50) better than required (45). Yield can be increased by 9 to 15% and quality decreased to required level of 45 cetane No. by recycling raffinate into SO_2 circuit. More satisfactory results are, however, obtained by use of SO_2 with butane, increasing quantities of the latter improving yield. 2 procedures were used, extraction of oil by SO_2 followed by butane extraction of SO_2 extract, or dilution of oil by butane followed by SO_2 extraction of mixture. Use of butane improved yields of 45 cetane No. product by 20 to 24% to max of 76·5% (with 60% SO_2, 180% butane). Results are tabulated and graphed. V. B.

1353. Solvent extraction. R. E. Treybal. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 58–67. Review covering 381 refs. E. J. C.

1354. Two component separations by double-solvent extraction. A. Klinkenberg. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 653–7.—Separation of a mixture into 2 products by extraction, using 2 solvents, is an established industrial operation. Graphs are presented to aid the solution of problems relating to feed and product compositions, solvent ratios, etc. The method is illustrated with data from literature. E. J. C.

1355. Consider operating techniques in these lube oil processes. E. P. King. *Petrol. Refin.*, 1953, **32** (3), 123–7. (*Western Petroleum Refiners Assoc., Beaumont, Feb.* 1953.)—A discussion of the advances in operating techniques since 1945 in the solvent refining of lub oils. Progress in the fields of fractional dist of raw lub stocks, propane deasphalting of residuum, phenol extraction, M.E.K.–toluene dewaxing, and contact clay finishing is discussed. R. D. S.

1356. Patents. U.S.P. 2,605,276 (31.8.46; 29.7.52). F. H. Bruner, H. V. Hess, and G. B. Arnold, assrs to Texas Co. Non-acidic (≥C_8) *A* are separated from acidic *B* water-sol oxygen containing aliphatic compounds by countercurrent extraction with a hydrocarbon solvent at 175° to 300° F in liq phase, the extract containing *A* and the raffinate containing *B*. V. P. P.

U.S.P. 2,628,894 (28.2.51; 17.2.53). G. L. Langmyhr. Countercurrent extraction apparatus and method.

U.S.P. 2,628,990 (28.10.50; 17.2.53). M. R. Morrow, assr to Standard Oil Development Co. Naphthenic hydrocarbons are separated from hydrocarbon fractions boiling between 80° and 300° F by extraction with furfural, using a furfural : hydrocarbon ratio of between 10 : 1 and 30 : 1 at 40° to 300° F in the presence of a phenol extract of a naphthenic lube oil fraction boiling between 570° and 850° F. The naphthenic hydrocarbons are in the extract phase.

U.S.P. 2.629,654 (9.11.46; 24.2.53). R. B. Olney, assr to Shell Development Co. Apparatus for contacting at least partially immiscible liquids in countercurrent flow.

U.S.P. 2,629,730 (25.10.49; 24.2.53). W. J. Denton and R. B. Bishop, assrs to Socony-Vacuum Oil Co. Hydrocarbons are partially oxidized and contacted with acetonitrile to extract the oxygen-containing compounds. J. M. S.

Ger.P. 861,692, 13.11.52. P. Rack, assr to Metallges. A.G. Plant for separating mixtures of liq of different sp. gr.
BrennstChemie, 1952, **33** (23–4). R. T.

Cracking

1357. Catalysis in petroleum refining. G. Egloff. *Bull. Ass. franç. Tech. Pétrole*, 1953 (97), 31–55.—Following processes are briefly surveyed, with flow sheets and indication of main reactions occurring: cat cracking, polymerization, alkylation, isomerization, dehydrogenation, cat reforming. V. B.

1358. Houdriforming reactions. H. Heinemann, G. A. Mills, J. B. Hattman, and F. W. Kirsch. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 130–4.—Apparatus and procedure reported for investigating reactions involved when *cyclo*hexane, methyl*cyclo*pentane, and *n*-heptane were subjected to Houdriforming at 800° to 950° F and 300 to 600 p.s.i. *cyclo*Hexane was isomerized to mainly benzene, while methyl*cyclo*pentane was the other main C_6 product. The latter compound, when used as feedstock, was dehydroisomerized, yielding mainly aromatics, the % of which depended on space rate and temp. *n*-Heptane underwent some isomerization, but cracking reactions also resulted and were predominate above 900° F. E. J. C.

1359. Houdriforming reactions. G. A. Mills, H. Heinemann, T. H. Milliken, and A. G. Oblad. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 134–7.—Cat mechanism of reactions involved is discussed. E. J. C.

1360. Houdriforming reactions. H. Heinemann, H. Shalit, and W. S. Briggs. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 800–2.—Studies carried out with Houdriforming cat showed the latter to be excellent desulphurization agents. E. J. C.

1361. Testing powdered cracking catalysts. P. H. Johnson and C. P. Stark. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 849–55.—Apparatus and experimental procedure described for comparing cracking cat, using a standard cat and a standard gas oil. E. J. C.

1362. A review of industrial catalytic cracking processes. J. Sirola. *Nafta* (*Yugoslavia*), Feb. 1953, **4** (2), 44–8.—The main technological features of the McAfee, Houdry, TCC, Fluid, and Suspensoid cat cracking processes are briefly described. (Author's Abstract.)

1363. Vickers completes package TCC unit. Anon. *Petrol. Refin.*, 1953, **32** (3), 118.—Describes the TCC unit opened in March at Potwin, Kansas, to handle 4000 b.d. gas oil (fresh feed stock), plus 2500 b.d. recycle oil. Features are the low-pressure air lift for the regenerated cat and an oil-well-derrick type structure for the cracking section. R. D. S.

1364. Patents. U.S.P. 2,602,771 (25.6.42; 8.7.52). J. C. Munday and E. W. S. Nicholson, assrs to Standard Oil Development Co. Naphtha reforming process in which the frequency with which the cat requires regeneration is reduced by frequently and intermittently treating the cat with hydrogen during the reaction period. This can be effected: (1) by maintaining a circulating stream of hydrogen through the cat and periodically injecting oil into this stream; (2) by feeding oil vapours and hydrogen alternately to the reaction zone; (3) by circulating finely divided cat continuously through reaction and hydrogen reactivation zones. It is believed that high mol. wt. unsaturated hydrocarbon polymers which deposit on the cat are hydrogenated to volatile hydrocarbons.

U.S.P. 2,602,651 (2.3.48; 8.7.52). M. R. Cannon, assr to Scientific Development Co. Packing material for use in phase reactions, comprising units of thin metal

sheets, each shaped so that it does not entirely lie within one phase. Each side of the unit has at least 100 perforations/sq. in., those on one side being recessed with respect to the adjacent surrounding surface, and on the opposite side being surrounded by a burr extending outwardly from the surface of the metal. The perforations are preferably grouped in adjacent rows, which may be separated by ridges.

U.S.P. 2,603,089 (U.K. 14.8.46; 16.7.52). R. J. Morley and S. F. Weston, assrs to I.C.I. Ltd. Rate of flow of a stream of particulate solid in stream-line flow through a vessel is measured by apparatus which comprises means *A* for changing the temp of a portion of the stream and means for determining the moment when this portion passes one or more selected points *B* downstream of *A*, *B* including a temp sensitive element.

U.S.P. 2,602,647 (30.3.51; 8.7.52). R. W. Miller, assr to Standard Oil Co. In coolers of fluid cat crackers, air and cat flow through a small dia pipe into tubes of a cooling section bundle to a larger dia pipe. Owing to the different densities, phase separation tends to occur with cat flowing through centre bundles and a dilute cat suspension through the peripheral tubes at high velocity, causing erosion. This is prevented by placing at the inlet of the large pipe a tapered, or inverted conical, baffle containing a plurality of ports, the area of which is proportional to the tube area above at any radial distance, the baffle being so constructed that the cat–air mixture is evenly distributed to the tubes.

U.S.P. 2,605,238 (18.11.50; 29.7.52). K. W. Krantz, assr to E.I. du Pont de Nemours and Co. Cat comprising MoO_3 (3 mol) and amorphous TiO_2 (1–8 mol) of surface area $\neq 150$ m²/g.

U.S.P. 2,605,237 (15.4.50; 29.7.52). G. M. Webb, assr to Standard Oil Co., Chicago. Conversion cat of stable activity and regeneratability consisting of a homogeneous, porous mixture of cat inactive silica and 10 to 25 wt % MgO, dry basis, in the form of cat active magnesium silicate, is prepared by intimately mixing a MgO-producing substance with active silica, converting the mixture to magnesium silicate, and deactivating the free silica.

U.S.P. 2,605,235 (4.1.49; 29.7.52). E. W. Pitzer, assr to Phillips Petroleum Co. Spent alumina–heavy metal oxide cat is reactivated by digesting the finely comminuted cat with an ammonium nitrate–nitric acid mixture for 1 to 50 hr so as to extract at least part of the metal oxides, evaporating the resulting mixture to dryness, heating the residue at 500° to 1000° F to convert any metal nitrate to oxide, and comminuting the product.

U.S.P. 2,605,228 (24.10.49; 29.7.52). G. B. Alexander and R. K. Iler, assrs to E.I. du Pont de Nemours and Co. A dense ppt of 10 to 150 μμ silica particles produced by pptg a soln with a polyvalent metal whose hydroxide in insol at pH 9, whereby the particles are surface reacted with the metal and pptd, is redispersed in water by removing the metal with a cation exchanger.

U.S.P. 2,604,662 (2.8.49; 29.7.52). E. A. Bodkin, assr to Socony-Vacuum Oil Co. A smooth, uniform extrusion of inorganic oxide hydrogels *A* is effected by forcing *A* through a die orifice whose surface is composed of an inert synthetic thermoplastic material having a Rockwell hardness number of 50 to 130 ($\frac{1}{2}$-inch steel ball, 60 kg force). V. P. P.

U.S.P. 2,627,499 (11.6.47; 3.2.53). R. W. Krebs, assr to Standard Oil Development Co. Shale is dist, and the oil produced cracked by subjecting the finely divided shale to dist conditions in a fluidized bed of cracking cat.

U.S.P. 2,627,506 (7.5.49; 3.2.53). E. A. Hunter and C. N. Kimberlin, assrs to Standard Oil Development Co. Metal oxide gel cat are made by reacting a salt of beryllium, aluminium, titanium, zirconium, tin, thorium, chromium, or iron with an excess of magnesia to form the corresponding metal oxide hydrogel, containing the unreacted magnesia dispersed therein, and soaking the hydrogel with solution of a salt of a metal less basic than magnesium, thereby pptg this metal as a hydrous oxide in the hydrogel. The magnesium salt formed is washed out and the hydrogel dried and calcined.

U.S.P. 2,628,157 (21.6.47; 10.2.53). G. F. Kuhn, assr to Sinclair Refining Co. Apparatus for cat regeneration comprising an elongated, arcuate, tubular regeneration chamber having the end walls close to one another and spaced baffles in the chamber.

U.S.P. 2,628,158 (6.3.50; 10.2.53). M. J. Wilcox and E. F. Schade, assrs to Sinclair Refining Co. Stripping vessel for finely divided cracking cat.

U.S.P. 2,628,188 (21.7.49; 10.2.53). C. G. Kirkbride and J. C. Dart, assrs to Houdry Process Corpn. Cat cracking of hydrocarbons by passing the charge of hydrocarbons into a transfer zone (I) containing a bed of hot granular cat at such a velocity that the cat is lifted out of the bed with the stream of hydrocarbons into and up a long narrow cracking zone (II), discharging the vapours and cat from the top of II into a disengaging zone (III), passing cat separated in III to a compact bed of contaminated cat (IV) below the level of III, passing inert gas through IV into III, passing cat from IV to a regeneration zone and then back to I.

U.S.P. 2,628,890 (20.6.46; 17.2.53). J. H. Shapleigh, assr to Hercules Powder Co. Sulphur-containing hydrocarbons are cracked to hydrogen and carbon oxides by passing them with steam over a cat containing at least 10% nickel at $<900°$ C.

U.S.P. 2,628,893 (24.5.50; 17.2.53). R. Kollgaard, assr to Houdry Process Corpn. Disengagement of gases from fluidized cat beds.

U.S.P. 2,628,932 (15.3.51; 17.2.53). H. I. Ringgenberg, assr to Sinclair Refining Co. In the fluidized cat cracking of hydrocarbons, a mixture of cat and hydrocarbon vapours is passed vertically upwards at a vapour velocity of 15 to 35 f.p.s. through a conduit providing a straight path 5 to 10 times its transverse dimension within a stripping column co-axially positioned below the reaction chamber, and is discharged into the lower portion of the reaction chamber. Spent cat passed downward from the bottom of the reaction chamber through the stripping column in heat exchange relationship with the ascending mixture of cat and hydrocarbon vapours.

U.S.P. 2,629,653 (25.10.46; 24.2.53). F. T. Barr, assr to Standard Oil Development Co. Apparatus for stripping occluded gases from a hot stream of fluidized solid particles.

U.S.P. 2,629,683 (16.11.49; 24.2.53). V. Haensel, assr to Universal Oil Products Co. Gasoline is reformed by contact with at least 2 successive beds of cat comprising alumina, platinum, and combined halogen, the cat in the first bed having a particle size not greater than $\frac{3}{32}$ inch and the cat in the second bed having a particle size greater than $\frac{3}{32}$ inch.

U.S.P. 2,629,684 (13.10.48; 24.2.53). F. W. Leffer, assr to Universal Oil Products Co. Fluidized cat conversion of hydrocarbons. J. M. S.

Ger.P. 863,791, 4.12.52. K. Kosterhon, assr to Bad. Anilin- & Soda-Fabr. Method for producing catalysts or absorbents of stable shape.

Ger.P. 863,032, 27.11.52. M. Pier and G. Free, assrs to Bad. Anilin- & Soda-Fabr. Production of ethane- and ethylene-rich gases by cracking.

Ger.P. 863,054, 27.11.52. F. Hamacher and E. Plauth, assrs to Bad. Anilin- & Soda-Fabr. Plant for cat reactions in gas or vapour phase in presence of agitated lumpy material.

Ger.P. 861,140, 6.11.52. Universal Oil Products Co. Process for pressure thermal cracking of hydrocarbon oils.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 865,037, 11.12.52. Bad. Anilin- & Soda-Fabr. Process for cat conversions with carbonaceous materials.

Ger.P. 865,335, 18.12.52. D. B. Ardern and M. Avenues, assrs to Houdry Process Corpn. Process for hydrocarbon conversion.

Ger.P. 865,504, 18.12.52. W. Gras and A. Steding, assrs to Didier Kogag-Hinselmann A.G. Process and plant for thermal cracking of gases containing methane and similar hydrocarbons.
BrennstChemie, 1953, **34** (1–2). R. T.

Hydrogenation

1365. Three-unit combustion refinery plant. Anon. *Petrol. Times*, 1.5.53, **57** (1454), 448.—A brief account is given of the world's first Platreater a hydrogenation process which refines aromatic concentrates prior to separation in a Uden unit, in operation at the Mount Pleasant, Mich., refinery of the Roosevelt Oil and Refining Corpn. A table gives feed and product data. G. A. C.

1366. Liquid-phase coal hydrogenation. K. Shibata. *Chem. Engng*, 1953, **60** (5), 214–18.—A report on a coal hydrogenation plant operated by the Japanese during the second world war. The success of the process lay in the reactor design, which incorporated heating sources and reaction zone in one high-pressure unit. The products were gasoline, methanol, and phenolic oils. Material and heat balances are included, with diagrams of the reactor and rotary sludge treater. D. M.

1367. Patents. U.S.P. 2,602,773 (8.12.48; 8.7.52). J. R. McKinley and W. C. Starnes, assrs to Gulf Research and Development Co. In destructive hydrogenation processes using a reducible metal oxide hydrogenating cat on an active cracking cat carrier which is periodically regenerated, steam formed by reduction of the regenerated cat causes its permanent deactivation. The regenerated cat is therefore treated with hydrogen sulphide, the partial pressure of water vapour formed being prevented from rising to an extent which will deactivate the cat. V. P. P.

U.S.P. 2,627,495 (25.11.49; 3.2.53). W. C. Lanning, assr to Phillips Petroleum Co. A heavy hydrocarbon oil is solvent extracted, the paraffinic raffinate is subjected to hydrogenolysis to yield gasoline and gas oil, and the aromatic extract is subjected to hydrogenolysis to yield gasoline. The gasoline from the hydrogenolysis of the raffinate is recycled to the solvent extraction as a solvent for the paraffins.

U.S.P. 2,628,981 (29.11.47; 17.2.53). D. E. Burney and B. H. Shoemaker, assrs to Standard Oil Co. Improved motor fuels are made from a *sec*-olefin–*tert*-olefin copolymer (I) containing gasoline boiling range components (II) by contacting I with CO and H_2 in the presence of Co or Fe to convert a portion of II into oxygenated derivatives, contacting the reaction products with H_2 in the presence of a hydrogenation cat to convert the unconverted products into a saturated motor fuel, and separating the latter. J. M. S.

Ger.P. 864,092, 4.12.52. E. Donath, H. Nonnenmacher, and O. Reitz, assrs to Bad. Anilin- & Soda-Fabr. Process for cracking pressure hydrogenation of heavy or middle oils.

Ger.P. 863,188, 27.11.52. Bad. Anilin- & Soda-Fabr. Process for converting low-mol olefins containing one tertiary C-atom into alcohols.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 867,088, 31.12.52. H. Bähr, assr to Bad. Anilin- & Soda-Fabr. Method for processing residues from pressure hydrogenation of coals, tars, and mineral oils.

Ger.P. 864,394, 11.12.52. J. Ibing and H. Vollmer, assrs to Ruhröl G.m.b.H. Reaction furnace for exothermic cat reactions.

Ger.P. 864,986, 8.1.53. H. Neweling and P. Pabst, assrs to Ruhrchemie A.G. Contact furnace for exothermic cat reactions, *e.g.*, cat CO hydrogenation.

Ger.P. 866,785, 31.12.52. O. Roelen and W. Rottig, assrs to Ruhrchemie A.G. Process for cat hydrogenation of CO.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 868,145, 15.1.53. K. Berger, assr to Bad. Anilin- & Soda-Fabr. Reaction vessel for pressure hydrogenation of coals, tars, and mineral oils.

Ger.P. 869,199, 22.1.53. W. Simon, G. Free, and W. von Füner, assrs to Bad. Anilin- & Soda-Fabr. Process for pressure hydrogenation of hydrocarbons.

Ger.P. 869,200, 22.1.53. W. von Füner, W. Oettinger, H. Nonnenmacher, and O. Reitz, assrs to Bad. Anilin- & Soda-Fabr. Process for pressure hydrogenation, dehydrogenation, reforming, or cracking of hydrocarbons.

Ger.P. 869,484, 22.1.53. M. Pier, K. Peters, and W. von Füner, assrs to Bad. Anilin- & Soda-Fabr. Method for producing low-boiling hydrocarbons from high-boiling, by aromatizing pressure hydrogenation.
BrennstChemie, 1953, **34** (3–4). R. T.

Polymerization

1368. Changes and expansion boost yields. A. L. Foster. *Petrol. Engr*, Jan. 1953, **25** (1), C28–30.—A cat polymerization unit to raise gasoline production by 2% is described. The straight octane rating of the polymer is 94 Research, with a higher blending value. One 2-stage compressor handles all the olefinic gases to the absorber, a Girbutol desulphurizing unit dealing with the raw gases. The operating routine is described, with a flow diagram, and data given for the resultant gasoline. G. H. G.

1369. Patents. U.S.P. 2,628,222 (22.11.48; 10.2.53). K. Nozaki, assr to Shell Development Co. Methacrylonitrile is polymerized in aq emulsion in the presence of a polymerization cat and an emulsifier. The ingredients are first heated to 90° to 150° C for 5 to 10 min, rapidly cooled to 0° to 25° C and maintained at that temp until polymerization is completed.

U.S.P. 2,628,223 (9.2.49; 10.2.53). J. C. Richards, assr to E. I. du Pont de Nemours and Co. Acrylonitrile is polymerized in aq soln in the presence of a perdisulphate cat and a sulphoxy reducing agent. The pH of the soln is maintained at 2·5 to 3·5 during the polymerization by addition of acid.

U.S.P. 2,628,225 (10.12.49; 10.2.53). T. S. Tutwiler, assr to Standard Oil Development Co. Methacrylate esters are polymerized in the presence of benzoyl peroxide, benzoin, and ferric laurate, the temp being maintained at 25° to 75° C for 5 to 35 hr and then at 95° to 110° C for 1 hr.

U.S.P. 2,628,956 (15.3.51; 17.2.53). R. W. Brown, assr to United States Rubber Co. 1 : 3-butadiene and mixtures thereof with arylolefines are polymerized at −100° to 0° C in aq emulsions containing sufficient ammonia to prevent freezing thereof.

U.S.P. 2,629,707 (16.6.50; 24.2.53). J. E. Charles, assr to Armstrong Cork Co. Synthetic rubber is made by the emulsion polymerization of butadiene and acrylonitrile in presence of sorbic acid, an emulsifying agent, and a cat.

U.S.P. 2,629,708 (29.6.50; 24.2.53). C. A. Uraneck and R. J. Goertz, assrs to Phillips Petroleum Co. Synthetic rubber is made by the emulsion polymerization of 1 : 3-butadiene and styrene in the presence of an emulsifying agent, the monohydroperoxide of *tert*-butyl–*iso*-propylbenzene, and diethylenetriaminemonocarbamate and hydrazine. The aq medium has a pH of 9 to 12.

U.S.P. 2.629,709 (5.9.50; 24.2.53). C. A. Uraneck and A. C. Rothlisberger, assrs to Phillips Petroleum Co. The monocarbamate used in U.S.P. 2,629,708 is replaced by a carbamate of tetraethylenepentamine. J. M. S.

Ger.P. 861,558, 13.11.52. W. Michael, O. Göhre, and E. Donath, assrs to Bad. Anilin- & Soda-Fabr. Process for cat polymerization of gaseous unsaturated hydrocarbons.

Ger.P. 863,038, 27.11.52. H. Grasshof, assr to Bad. Anilin- & Soda-Fabr. Method for producing lub oils by polymerization of olefins.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 867,387, 8.1.53. G. Ibing, assr to Ruhröl G.m.b.H. Production of polynuclear hydrocarbons with more than 5 rings in the mol, *e.g.*, coronae.

Ger.P. 867,992, 8.1.53. Bad. Anilin- & Soda-Fabr. Process for converting ethylene homologues into oily or higher mol products by polymerization.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 868,293, 15.1.53. M. Otto, H. Güterbock, and R. Melan, assrs to Bad. Anilin- & Soda-Fabr. Method for producing oils by polymerization of *iso*butylene.
BrennstChemie, 1953, **34** (3–4). R. T.

Alkylation

1370. Patent. U.S.P. 2,604,494 (29.12.45; 22.7.52). L. C. Morris and F. M. Smith, assrs to Phillips Petroleum Co. A product *A* b.p. 250° to 500° F containing ⩽50 vol % of aromatic *B* and naphthene *C* hydrocarbons, the rest being olefins *D* (10 to 30 vol % of *A*) and paraffins *E*, is obtained by cat cracking a gas oil, mixing with an aromatic hydrocarbon *E* (*E* : *D* = 5 to 15 : 1), and then subjecting the mixture to alkylation conditions in presence of a cat, an olefin free aromatic hydrocarbon product, b.p. 150° to 500° F containing *B*, *C* and *E* being separated from the product. V. P. P.

Isomerization

1371. Review of olefin isomerization. H. N. Dunning. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 551–64.—Comprehensive review of literature and patents for last 50 years. 89 refs. E. J. C.

1372. Isomerization of olefins. L. Berg, H. A. Saner, L. B. Gustafson, W. J. Luke, and W. S. Reveal. *Petrol. Engr*, Jan. 1953, **25** (1), C32–4.—Pentene, hexene, heptene, octene, and ethyl hexene were isomerized in a continuous recycling system, a diagram and description of the equipment being given. The cat is prepared by treating $\frac{1}{8}$-inch activated alumina tablets with anhydrous hydrogen fluoride, the cat being burned off every 15 to 20 hr. Tables are given on operating data, material balances, product analyses, and octane ratings.

Results indicate that limitations of once-through operations are largely overcome by the continuous method, with almost complete conversion to branched-chain isomers. G. H. G.

1373. Isomerization of pentanes and hexanes. B. J. Evering, E. L. D. D'Ouville, A. P. Lien, and R. C. Waugh. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 582–9.—Apparatus and procedure reported for studying the inhibition of secondary reactions during the isomerization of pure and mixed hydrocarbons, using aluminium chloride as a cat. *n*-Pentane, mixtures of *n*- and *iso*pentanes, hexanes, and a light naphtha were used as feedstocks. Hydrogen, aromatics, naphthenes, and *iso*butane were found to inhibit disproportionation of pentanes and increase cat life during isomerization. Hexanes were only successfully isomerized in presence of hydrogen. Olefins nullified the effect of inhibitors and accelerated secondary reactions. E. J. C.

1374. Isomerization of *n*-pentane. A. Clark, M. P. Matuszak, N. C. Carter, and J. C. Cromeans. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 803–6.—Apparatus and experimental procedure reported for investigating the isomerization of *n*-pentane at low hydrogen : hydrocarbon ratios, using molybdena–alumina cat. Results indicate that mol ratio of H_2 : hydrocarbon between 0·3 and 0·8 gave most efficient conversion. E. J. C.

1375. Patents. U.S.P. 2,629,754 (17.12.48; 24.2.53). F. E. Condon, assr to Phillips Petroleum Co. Hydrocarbons are isomerized by mixing with *cis*decalin and subjecting the mixture to an isomerization cat. The products are separated into the isomerized hydrocarbon, *cis*decalin, *trans*decalin, and unchanged hydrocarbons, and the *trans*-decalin is converted to the *cis*isomer and returned to the process. J. M. S.

Ger.P. 862,744, 20.11.52. J. Giesen and F. Strätz, assrs to Bad. Anilin- & Soda-Fabr. Process for isomerization of saturated hydrocarbons.
BrennstChemie, 1952, **33** (23–4). R. T.

Chemical and Physical Refining

1376. Autofining process. Anon. *Industr. Chem. Mfr.*, 1953, **29**, 164–8.—Operating details are given of cat desulphurization process developed by Anglo-Iranian Oil Co. 350-b.d. plant at Grangemouth treats SO_2 extract from kerosine for high octane blending component in T.V.O. Process operates at 780° F and 100 p.s.i., recycling 2000 standard cu. ft. product gas (80% hydrogen) per brl of feed. Cat has been in use

16,000 hr and regenerated about 100 times. Sulphur is reduced from 1·04% in feed to 0·45% in product. 3500-b.d. unit at Llandarcy, commissioned in July 1952, is operating on white spirit and T.V.O. Sulphur reduced in former from 0·143 to 0·003%, in latter from 0·645 to 0·106% wt, yields 100% vol. Investment cost of Llandarcy unit within battery limits was £250,000. Photographs and flow sheet. A. C.

1377. Thermodynamic properties of ammonia at high temperatures and pressures. E. R. Grahl. *Petrol. Process.*, 1953, **8** (4), 562–5.—Enthalpy and sp. ht. relationships for ammonia are presented over a temp range of −100° to 700° F, and a press range from 0 to 16,000 p.s.i.a. They have been derived by graphical methods employing rigorous thermodynamic functions, and using reliable experimental data.

While the properties developed were originally planned to fill a specific demand involving the manufacture of urea, they are general in nature and can be used for any process design calculations. J. W. H.

1378. Some properties of aqueous suspensions of bentonite, cement, and clay. V. Stubican and A. Strmac. *Nafta* (*Yugoslavia*), Feb. 1953, **4** (2), 39–43.—Data are presented showing sedimentation volumes of cement–bentonite and cement–bentonite–clay suspensions in water, as well as changes in consistency of such suspensions by dilution, by the hardness of water, and by varying the cement–bentonite ratio.

Curves covering equal consistencies are straight lines up to a bentonite content of *ca* 40%. Such curves may be used for a controlled variation of individual components in the mixture.

It is concluded that by paralleling the data obtained with the general behaviour of colloidal systems, the action of cement particles upon bentonite soln is equal to the action of a colloid of opposite charge. This may explain why the colloidal properties of such systems are dependent upon the order in which individual components are added to the mixture.

On the basis of the results obtained, a procedure has been worked out for the practical use of such mixtures, if the activation of natural bentonite is to be carried out on the place of consumption.

The procedure has been successfully applied for dam tightening works at the building sites of several water power plants. The data presented may also be of interest in oil well cementing. (Authors' Abstract.)

1379. Patents. U.S.P. 2,604,185 (8.11.46; 22.7.52). H. F. Johnstone and A. W. Anthony, assrs to Pease, Anthony Equipment Co. Gases are washed by passing through a Venturi passage and introducing into the accelerated gas stream solid jets of washing liq from a plurality of nozzles spaced over the stream cross-section.

U.S.P. 2,603,311 (11.5.48; 15.7.52). H. D. Frazier and F. C. Riesenfeld, assrs to Fluor Corpn. Dehydration of a gas, *e.g.*, natural or refinery gas, by contacting the gas with aq glycol *A* (diethylene glycol) soln containing a substantial quantity of a dissolved non-aq organic liq diluent *B* of less visc than *A* and having b.p. >190° C, the soln being regenerated by heating and vaporizing the absorbed moisture. *B* is a monohydric alcohol (aliphatic, substituted aliphatic, aromatic, alicyclic, or heterocyclic), or a water sol mono- or poly-ether of a polyhydric alcohol. V. P. P.

U.S.P. 2,627,496 (25.2.50; 3.2.52). C. W. Stratford, assr to Stratford Engineering Corpn. Lub oils are acid treated, neutralized, the neutralizing agent separated, and the lub oil contacted with steam in a closed system. Finally, the steam is condensed and the oil separated from the water.

U.S.P. 2,627,513 (6.4.49; 3.2.53). W. F. Arey, assr to Standard Oil Development Co. Normal aliphatic hydrocarbons are separated from other types of hydrocarbons by contacting with urea at below 32° F in the presence of less than 5 vol % of methanol.

U.S.P. 2,628,933 (21.3.49; 17.2.53). S. Eagle and J. W. Scott, assrs to California Research Corpn. Mixtures of organic liq are separated by contacting in a guard zone (I) with a solid adsorbent to remove very strongly adsorbed non-aromatic polar compounds, separating the effluent from I with a further solid adsorbent into at least 2 fractions, and regenerating the adsorbent in I by contacting it with a part of one of said fractions.

U.S.P. 2,628,986 (29.10.49; 17.2.53). E. G. Wallace and J. J. Menn, assrs to Shell Development Co. *iso*Propanol is purified by refluxing in the presence of an oxidizing agent and then contacting with an ion exchange resin.

U.S.P. 2,628,991 (14.9.49; 17.2.53). H. G. Schneider, W. C. Van Sicien, and P. W. Brakeley, assrs to Standard Oil Development Co. Boron fluoride (I) is removed from gaseous mixtures containing *iso*butylene before the latter polymerizes, by dispersing into the gaseous mixture a C_2 to C_{16} dialkyl ether to form a complex with I and scrubbing with a hydrocarbon to remove the complex.

U.S.P. 2,629,686 (25.8.50; 24.2.53). F. Grosser, assr to General Aniline and Film Corpn. 1 : 4-butanediol is purified by treatment with activated charcoal, acid treated silica gel or fuller's earth, followed by vacuum dist. J. M. S.

Ger.P. 861,547, 13.11.52. J. Hetterich. Process and plant for liq and gas filtration.

Ger.P. 861,551, 13.11.52. G. Mayer and H. H. Saenger, assrs to Farbwerke Hoechst. Process for recovering highly-conc H_2SO_4 or oleum from dil H_2SO_4 waste.

Ger.P. 861,552, 13.11.52. C. von Girsewald, W. Siecke, and M. Wohlwill, assrs to Metallges. A.G. Process and plant for converting dil H_2SO_4 waste into highly-conc H_2SO_4.

Ger.P. 862,819, 20.11.52. D. Seekamp. Separator for cutting out solid or liq constituents from flue gases, etc.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 867,846, 8.1.53. A. Roelen and H. Heckel, assrs to Ruhrchemie A.G. Process for obtaining methane from mixtures of oxides of carbon with hydrogen.

Ger.P. 867,690, 8.1.53. H. Häuber, assr to Bad. Anilin- & Soda-Fabr. Process for separating small amounts of diene hydrocarbons from gas mixtures containing olefins and H_2.

Ger.P. 865,336, 18.12.52. G. Schiller, assr to Bad. Anilin- & Soda-Fabr. Process for purifying liq hydrocarbons.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 869,198, 22.1.53. H. Nonnenmacher and W. von Füner, assrs to Bad. Anilin- & Soda-Fabr. Process for purifying crude benzene.

Ger.P. 869,201, 22.1.53. O. von Schickh, assr to Bad. Anilin- & Soda Fabr. Process for obtaining higher mol, saturated, non-aromatic, nitro hydrocarbons from their mixtures with the initial hydrocarbons.

Ger.P. 868,953, 22.1.53. C. Eymann, assr to C. Eymann. Process for separating HCN from C-dist or similar gases.

Ger.P. 869,060, 22.1.53. H. Häuber and W. Hagen, assrs to Bad. Anilin- & Soda-Fabr. Process for separating olefins from gases.
BrennstChemie, 1953, **34** (3–4). R. T.

Special Processes

1380. Catalyst–pressure relationships in hydrogenolysis of coal. M. G. Pelipetz, J. R. Salmon, J. Beyer, and E. L. Clark. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 806–9.—A bituminous coal was hydrogenated at varying pressures from 500 to 4000 p.s.i.g., using tin and molybdenum cat. A plot of specific reaction rates as a function of pressure showed a dependence between H_2 pressure and cat activity. This has practical bearing on the selection of operating conditions for the production of synthetic fuels by coal hydrogenation. E. J. C.

1381. Liquid fuel from coal. C. C. Chaffee and L. L. Hirst. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 822–38.—Fairly detailed description and flow diagram given of a pilot plant for production of liq fuels by liq and vapour phase hydrogenation methods. Analyses of coals used, operating conditions, and product properties are tabulated. More important equipment is also described. E. J. C.

1382. Conversion of alcohols into the next higher homologues with carbon monoxide and hydrogen. K. H. Ziesecke. *BrennstChemie*, 1952, **33** (23–4), 285–97. (*Lecture May* 14, 1952 *in Max-Planck-Inst. for coal research, Mulheim, Ruhr.*)—Recently available information on similar work precedes an investigation of corrosion resistance of many alloys to cobalt hydrocarbonyl formed under CO–H_2 pressure from the Co cat. Results are presented in tables and curves of experiments involving reaction variables, time, pressure, temp, and CO : H_2 ratio. Methanol and higher, especially *sec-* and *tert*-alcohols, are converted on Co cat *ca* 200° C and 1200 atm pressure with CO and H_2 into the next higher homologues. Conversion to an alcohol one C-atom higher is slower as chain length increases. By-products are aldehydes, ethers, esters, acids, and ethers of ethylene glycol. Analytical procedure is given in detail. Cyclic alcohols, *e.g.*, benzyl alcohol and *cyclo*hexanol, are converted into β-phenylethyl alcohol or *cyclo*hexylcarbinol. The reaction takes place at lower pressures and temp than with methanol. Ketones react over their hydrogenation products to corresponding *sec*-alcohols. Using CO-rich synthesis gas (CO : H_2 = 1·5 : 1), the conversion product of methanol consists of *ca* 70% C_2-compounds, ethanol, acetic acid, acetates. The reaction mechanism is discussed. It is assumed that alcohol formation occurs after intermediate dehydrogenation to corresponding olefins, by hydroformylation, and connected hydrogenation of the aldehydes formed. 31 literature refs. R. T.

1383. Products of the hydrogenation of CO over an ion catalyst. A. W. Weitkamp, H. S. Seelig, N. J. Bowman, and W. E. Cady. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 343–9.—Carbon monoxide was hydrogenated by passing it with approx 2 vol H_2 through fluidized bed reactors containing iron oxide. Operating temp was 280° to 360° C and pressure 18 to 38 atm. This modified Fischer–Tropsch process resulted in an oil containing hydrocarbons and oxygenated compounds. Hydrocarbons were analysed by dist, chromatography, spectrometric, and other methods. % yield reaches a max at 3 carbon atoms, and then declines exponentially with increasing number of C atoms. Among aliphatic and alicyclic compounds, olefins predominate and straight-chain structures are prevalent. Straight-chain content decreases exponentially with increasing C number. E. J. C.

1384. Selective absorption of hydrogen sulphide. F. E. Miller and A. C. Kohl. *Oil Gas J.*, 27.4.53, **51** (51), 175.—Tests by Fluor Corpn show that methyldiethanolamine soln has appreciable selectivity for H_2S in presence of carbon dioxide. Costs are greater than those for commonly used soln. G. A. C.

1385. The " Autofining " process at Llandarcy and Grangemouth. Anon. *Petrol. Times*, 3.4.53, **57** (1452), 282.—A brief description is given of the new cat disulphurization process developed by Anglo-Iranian Oil Co. and termed " Autofining." G. A. C.

1386. Petrochemicals unlimited. G. Egloff. *Oil Gas J.*, 13.4.53, **51** (149), 124.—A review of the petrochemical industry shows that 25% of the total chemical production is made from petroleum sources and the industry is valued at over $2 billion. Plastics, synthetic rubbers, detergents, agricultural chemicals, aromatics, and phenols are among subjects dealt with. G. A. C.

1387. Patents. U.S.P. 2,601,904 (3.12.46 ; 1.7.52). R. W. Erwin, assr to Salt Water Control Inc. A horizontal emulsion treater for breaking crude oil emulsions by contacting with hot water.

U.S.P. 2,605,233 (8.2.52 ; 29.7.52). M. De Groote, assr to Petrolite Corpn. Water-in-oil pet emulsions are broken by adding a compound of the general formula

$$(HOOC_{n''}RCO(OH_6C_3)_n - NR' - (C_3H_6O)_{n'}COR(COOH)_{n''}$$

wherein R′ = a phenyl, methylphenyl, or benzyl radical ; n and n' are integers, $n + n' = 15$ to 80 ; n'' is an integer ≥ 2 ; R is the radical of the acid R(COOH) $(COOH)_{n''}$; the parent diol prior to esterification being water-insol and kerosine sol.

U.S.P. 2,605,232 (8.2.52 ; 29.7.52). M. De Groote, assr to Petrolite Corpn. Water-in-oil type pet emulsions are broken by adding an acidic partial ester of a polycarboxy

acid *A* and a water-insol oxypropylation derivative *B* (mol. wt. 2000 to 25,000) of a water-sol polyglycerol or polyglycerol ether having <4 OH groups and no radical of <8 uninterrupted carbon atoms, 1 mole of *A* being used for each OH radical in *B*.

U.S.P. 2,605,230–1 (8.2.52; 29.7.52). M. De Groote, assr to Petrolite Corpn. Water-in-oil type pet emulsions are broken by adding a compound of the general formula

(*a*) $(HOOC)_{n'}RCO(OC_3H_6)_nOC(CH_3)_2CH_2CH(CH_3)O(C_3H_6O)_{n'}COR(COOH)_{n''}$

(*b*) $(HOOC)_{n'}RCO(OC_3H_6)_nOCHCH_2O(C_3H_6O)_{n'}COR(COOH)_{n''}$
$\quad\quad\quad

in the main zone are then controlled in accordance with the CO_2 contents of the gas streams.

U.S.P. 2,602,810 (2.6.49; 8.7.52). C. W. Montgomery and W. A. Horne, assrs to Gulf Research and Development Co. Hydrocarbon synthesis process, operated with long cat life and good yields of desired hydrocarbons, is carried out on the adiabatic principle, so that control of the temp and cat is effected by the composition and quantity of gases contacted with the cat. Preferably, a gas mixture consisting of 1 part by vol of a feed gas consisting of H_2 and CO in molar ratio at least 2·5 : 1, and 8 to 15 vol of gas recycled from products of the reaction, the mixture containing H_2 and CO in mol ratio at least 15 : 1, is contacted with a fixed bed iron cat at synthesis temp and superatm pressure. The products are cooled to condense at least the normally liq hydrocarbons (C_4 and higher), the gaseous products being partly recycled and partly removed.

U.S.P. 2,602,811 (28.12.49; 8.7.52). C. W. Montgomery and W. A. Horne, assrs to Gulf Research and Development Co. Synthesis process which comprises passing into contact with the first of a series of beds of iron synthesis cat at 430° to 525° F a gas mixture containing ≥ 2 mol % CO and ≤ 80 mol % H_2, H_2 : CO being ≤ 40 : 1, at a rate to produce a temp gradient of 100° to 200° F, passing the partially reacted gases in contact with the remaining beds of the series, the CO content being adjusted by make-up gas added between each bed, cooling the mixture between each pair of beds to 430° to 525° F, the rate of CO addition being adjusted to maintain a temp gradient of 100° to 200° F across each bed and produce a progressively lower H_2 : CO ratio with minimum ratio to last bed of 15 : 1.

U.S.P. 2,605,234 (1.12.47; 29.7.52). A. H. Friedman, assr to Phillips Petroleum Co. Carbon deposits on finely divided Fischer–Tropsch cat are removed by abrading the particles against each other while suspended in an inert gas.

U.S.P. 2,605,275 (23.10.48; 29.7.52). K. K. Kearby and J. F. Black, assrs to Standard Oil Development Co. Fischer–Tropsch process employing a fluidized cat consisting essentially of ≤ 5 wt % (as Fe_2O_3) of a ferric component with ≤ 1 mol of a divalent metal component capable of forming a spinel type compound (oxygen compound of Mg or Zn) and obtained by reducing a composite whose oxide analysis is *ca* 54% MgO, 40% Fe_2O_3, 5% CuO, and 1% K_2O, with hydrogen at 600° to 1800° F.

V. P. P.

U.S.P. 2,627,318 (8.8.49; 3.2.53). W. Swerdloff, assr to Socony-Vacuum Oil Co. Hydrocarbons are recovered from gas mixtures by cooling to condense at least some of the water present, separating the condensed water and any condensed hydrocarbons, drying the said hydrocarbons with a solid dessicant, drying the uncondensed gases with a solid dessicant, mixing the dried hydrocarbons with the dried gases, and refrigerating the mixture to condense all but the least condensable constituent of the mixture.

U.S.P. 2,627,498 (26.9.49; 3.2.53). D. F. Fink, R. A. Greger, and F. R. Alsberg, assrs to Shell Development Co. Bitumen is oxidized by preheating it mixed with 2 to 20 % wt of petrolatum at 150° to 600° F in the absence of oxygen, but in the presence of a Friedel–Crafts cat and subsequently air-blowing at 325° to 550° F.

U.S.P. 2,627,522 (29.10.48; 3.2.53). R. W. Krebs and W. K. Lewis, assrs to Standard Oil Development Co. Synthesis of hydrocarbons from carbon monoxide and hydrogen in presence of a fluidized cat. The invention is concerned with a method of maintaining the reaction temp at the desired level.

U.S.P. 2,627,527 (14.5.48; 3.2.53). G. C. Connolly and D. L. Cottle, assrs to Standard Oil Development Co. Olefins of the formula $CH_2 : CR{\cdot}CH_3$, where R is hydrogen or methyl are oxidized to unsaturated aldehydes by passage with oxygen over a cat consisting of silica gel impregnated with cupric oxide at 175° to 450° C.

U.S.P. 2,627,529 (23.10.47; 3.2.53). C. F. Feasley and W. H. Stover, assrs to Socony-Vacuum Oil Co. 1 : 1-difluoro-1-chloroethane is converted to 1 : 1-difluoroethylene, 1-chloro-1-fluoroethylene and polymers and copolymers thereof by pyrolysis at 1500° to 1700° F for 1·9 to 60 sec.

U.S.P. 2,627,933 (28.6.47; 10.2.53). J. W. Titer, assr to Sinclair Refining Co. A barrier diffusion membrane for separation of a hydrogen-rich gas from a gas mixture

containing hydrogen, comprises a porous supporting member and a layer of a silicon, aluminium, or zirconium oxide aerogel moulded thereon.

U.S.P. 2,628,968 (30.9.48; 17.2.53). C. H. Holder, assr to Standard Oil Development Co. Reduction of carbon formation in the Fischer–Tropsch process using a fluidized potassium salt-promoted iron cat.

U.S.P. 2,628,969 (Germany 1.10.48; 17.2.53). W. Rottig, assr to Ruhrchemie A.G. Cat for Fischer–Tropsch process is a mixed, reduced, iron oxide–alkali metal salt precipitation product containing 5 to 10% of alkali metal salt formed *in situ* during precipitation of the iron.

U.S.P. 2,628,970 (7.7.50; 17.2.53). J. H. Arnold and F. B. Grosselfinger, assrs to Hydrocarbon Research Inc. The yield of hydrocarbons of the motor fuel type and the life of the cat in the Fischer–Tropsch process is increased by maintaining 35 to 55 vol % of hydrogen in the synthesis gas, withdrawing the reaction gases from the synthesis zone after the CO content has fallen to 1·5 to 4 vol %, but, before the hydrogen content has fallen below 20 vol %, separating a tail gas free from C_3 and higher hydrocarbons from the products, and recycling some of the tail gas to the production of the synthesis gas and some to the synthesis zone.

U.S.P. 2,628,983–4 (U.K. 13.2.47; 17.2.53). B. V. Aller, R. H. Hall, D. C. Quin, and K. H. W. Turck, assrs to Hercules Powder Co. Phenols are made by oxidizing in the liq phase an alkylbenzene having a *tert*-carbon atom in the α-position to the ring, *e.g.*, *iso*propylbenzene, by mol oxygen, to produce a soln of the corresponding hydroperoxide in unchanged alkylbenzene, which is then contacted with acid. A phenol and a ketone are then separated.

U.S.P. 2,682,985 (5.12.49; 17.2.53). De L. E. Winkler and H. de V. Finch, assrs to Shell Development Co. Phenol is prepared from *cyclo*hexanone, *cyclo*hexanol, or mixtures thereof by dehydrogenation in the presence of a cat consisting of iron oxide and an alkaline compound of an alkali metal or alkaline earth metal.

U.S.P. 2,628,989 (26.11.51; 17.2.53). C. B. Miller, assrs to Allied Chemical and Dye Corpn. Fluoro-olefins are made by dehydrochlorinating chlorofluoroethanes in the presence of CCl_4 at 500° to 610° C.

U.S.P. 2,629,728 (22.8.49; 24.2.53). R. B. Anderson and J. F. Shultz, assrs to U.S.A. (Secretary of the Interior). Hydrogen is reacted with carbon oxides in the presence of an iron nitride to produce hydrocarbons.

U.S.P. 2,629,729 (19.12.46; 24.2.53). E. T. Layng, assr to Hydrocarbon Research Inc. Describes method of operating the Fischer-Tropsch process using a fluidized iron cat so as to suppress decrease in cat particle density.

U.S.P. 2,628,161 (17.9.48; 10.2.53). B. J. Mayland, assr to Phillips Petroleum Co. Manufacture of synthesis gas from natural gas using fluidized iron oxide cat.

U.S.P. 2,628,200 (28.12.48; 10.2.53). W. W. Crouch, assr to Phillips Petroleum Co. Alkaryl sulphonates are made by sulphonating an alkylated aromatic compound, dividing the sulphonation mixture, into two portions, A and B, the relative quantities of A and B being chosen to produce the desired sodium sulphate content in the final detergent, mixing A with water and separating the sulphonic acid-rich upper layer, mixing this upper layer with B, neutralizing the mixture with sodium hydroxide, and drying the product.

U.S.P. 2,628,249 (3.1.51; 10.2.53). A. J. Bruno, assr to Pittsburgh Coke and Chemical Co. Esterifying carboxylic acids or their anhydrides with alcohols in the presence of sulphuric or a sulphonic acid and activated carbon.

U.S.P. 2,628,252 (7.12.50; 10.2.53). C. J. Albisetti, assr to E. I. du Pont de Nemours and Co. Mono-olefins add on to α-β-unsaturated carbonyl compounds by heating to 300° to 360° C for not more than 15 min, to yield δ, ε-unsaturated carbonyl compounds.

U.S.P. 2,628,259 (6.11.47; 10.2.53). P. H. Dirstine and E. L. Dance, assrs to Dow Chemical Co. Describes special conditions for preparing vinylidene chloride and vinyl chloride from chlorine and ethane or a mixture of ethane and ethylene.

U.S.P. 2,628,674 (5.8.48; 17.2.53). C. B. Fore, assr to United Carbon Co. Gas injector for distributing a hydrocarbon gas in a carbon black converter.

U.S.P. 2,628,891 (14.9.49; 17.2.53). H. H. Hahn and W. F. Hendricks, assrs to Godfrey L. Cabot Inc. Apparatus for producing impingement carbon black.

U.S.P. 2,628,965 (20.8.46; 17.2.53). F. W. Sullivan, assr to General Aniline and Film Corpn. Hydrocarbon mixtures containing more than 50% olefins and not less than 5% of impurities, consisting of carbon monoxide and acetylenic compounds, are passed in the gas phase with oxygen through a fluidized mass of finely divided silver oxidn cat at 200° to 300° C, and olefin oxides are separated from the reaction products.

U.S.P. 2,629,735 (28.12.49; 24.2.53). D. L. Cottle and D. W. Young, assrs to Standard Oil Development Co. Esters are made by reacting an ether and a lower aliphatic carboxylic acid in the presence of a solid acidic ion exchange resin at 40° to 125° C.

U.S.P. 2,629,744 (19.9.50; 24.2.53). G. G. Joris, assr to Allied Chemical and Dye Corpn. In the oxidation of *iso*propylbenzene (I) to its hydroperoxide by oxygen in the liq phase, I is pretreated with porous adsorptive alumina.

U.S.P. 2,629,747 (16.12.50; 24.2.53). M. C. Fuqua, assr to Standard Oil Development Co. Spent sulphuric acid contaminated with carbonaceous materials is concentrated to 65 to 70 wt %, a wash oil is added to cause the carbonaceous material to separate by flotation, the acid is separated from the oil and further concentrated.

U.S.P. 2,629,748 (23.12.48; 24.2.53). F. E. Condon, assr to Phillips Petroleum Co. Decalin produced by the hydrogenation of naphthalene is separated into the *cis* and *trans*isomers by dist and the *cis* isomer is reacted with *tert*-butyl chloride in the presence of aluminium chloride to produce 9-chlorodecalin.

U.S.P. 2,629,753 (26.8.48; 24.2.53). L. K. Frevel and J. W. Hedelund, assrs to Dow Chemical Co. Ethane is pyrolized to ethylene by passing it at 800° to 1000° C with an inert diluent through a bed of pieces of metal oxides or silicates, infusible and irreducible by hydrocarbons at 1000° C and which have manganese, iron, copper, or cobalt deposited on their surfaces. J. M. S.

Ger.P. 862,299, 20.11.52. E. Freitag. Production of rubber fillers consisting essentially of activated carbon.

Ger.P. 861,238, 6.11.52. M. Pier, E. Donath, and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Production of low-boiling uniform aromatic hydrocarbons by dealkylation of high-boiling aromatic hydrocarbons.

Ger.P. 863,033, 27.11.52. H. Laudenklos, assr to Bad. Anilin- & Soda-Fabr Method for producing hydrocarbons.

Ger.P. 863,186, 27.11.52. Bad. Anilin- & Soda-Fabr. Process for regenerating used, so-called iron fusion cat.

Ger.P. 863,187, 27.11.52. O. Roelen and H. Heckel, assrs to Ruhrchemie A.G. Method for producing iron cat containing CaO for CO hydrogenation.

Ger.P. 863,935, 4.12.52. A. Scheuermann and K. Meisenheimer, assrs to Bad. Anilin- & Soda-Fabr. Method for producing, *e.g.*, low-boiling liq hydrocarbons by reaction of CO with H_2.
BrennstChemie, 1952, **33** (23–4.)

Ger.P. 863,936, 4.12.52. K. Meisenheimer, F. Stöwener, and O. Vorbach, assrs to Bad. Anilin- & Soda-Fabr. Method for producing long-chain hydrocarbons from CO and H_2.

Ger.P. 863,034, 27.11.52. M. Kröger, assr to Essener Steinkohlenbergwerke A.G. Method for producing pure benzene.

Ger.P. 863,495, 27.11.52. O. Klöpfer, assr to Bad. Anilin- & Soda-Fabr. Process for dehydrogenation of primary and secondary alcohols.

Ger.P. 863,654, 4.12.52. P. Nashan, assr to Gutehoffnungshütte Oberhausen A.G. Process for oxidn of methane or its homologues.

Ger.P. 863,195, 27.11.52. M. Pier and K. Peters, assrs to Bad. Anilin- & Soda-Fabr. Method for producing fatty acids by oxidn of high-boiling paraffins.

Ger.P. 860,947, 6.11.52. T. W. Pfirrmann, assr to Bad. Anilin- & Soda-Fabr. Method for producing oxidn products containing carboxylic acids by hydrocarbon oxidn.

Ger.P. 861,247, 6.11.52. O. Grosskinsky, B. Jüttner, and W. Thürauf, assrs to Kohlentechnik G.m.b.H. Process for obtaining carboxylic acid mixtures.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 864,552, 11.12.52. W. Reppe, K. Klager, and O. Schlichtling, assrs to Bad. Anilin- & Soda-Fabr. Method for producing a hydrocarbon.

Ger.P. 864,865, 11.12.52. G. Scheuing, B. Walach, and C. Vogelbach, assrs to C. H. Boehringer Sohn. Method for producing δ-heptachloro*cyclo*hexane from benzene.

Ger.P. 864,640, 11.12.52. W. Hirschberger and T. Lajus, assrs to Bad. Anilin- & Soda-Fabr. Petrol stable in storage.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 868,596, 15.1.53. O. Roelen, assr to Ruhrchemie A.G. Method for producing H_2 by cat conversion of gases containing CO.

Ger.P. 869,192, 22.1.53. J. Daniels, assr to H. Koppers G.m.b.H. Method for converting gases containing hydrocarbons to H_2 and CO.

Ger.P. 868,146, 15.1.53. Bad. Anilin- & Soda-Fabr. Method for producing cat from Cr_2Cl_6 and excess ZnO for alcohol synthesis from CO–H_2 mixtures.
BrennstChemie, 1953, **34** (3–4). R. T.

Metering and Control

1388. Trends in refinery instrumentation. Pt 6. Bristol Dynamaster potentiometer and bridges. C. F. Johnson, Jr. *Petrol. Engr*, Jan. 1953, **25** (1), C37–41.—The selection, installation, maintenance, checking, and general care are dealt with. The Dynamaster bridge is a high-speed, self-balancing instrument, designed to measure resistance, inductance, or capacitance. A circuit diagram with a list of components is given, and bridge operation described, its uses being widened by only minor modifications.

The second model is a high speed, self-balancing D.C. potentiometer. Some parts of the 2 models are identical, thus simplifying the stocking of replacements where both types are used. Both models offered with either round or strip chart style of recording system. Multiple-record Dynamasters are available for recording 2 to 16 separate measuring elements. Synchroverter, a synchronous electrical switch, is described, and its use in the Dynamaster instrument system illustrated. G. H. G.

1389. Latest developments in monitoring process variables. A. F. Sperry. *Petrol. Refin.*, 1953, **32** (3), 128–32. (*Symposium on Instrumentation. Texas A. and M. Coll., Jan.* 1953.)—An account is given of monitoring methods whereby the number of instruments and size of process under an operator may be increased by freeing him from information gathering and repetitive control operations and calling his attention to any detailed abnormalities, as soon as they are detected. Electrical scanning systems which can cover up to 20 points/second are described. R. D. S.

1390. Solution concentration controller. P. Hart and R. C. King. *Oil Gas J.*, 20.4.53, **51** (50), 169.—An automatic control system is described for continuous evaporators concentrating soln of chemicals. A flow sheet is given, together with a pressure–temp concentration chart. G. A. C.

1391. Detector for organic chlorides in condensate. P. Hart and K. C. King. *Oil Gas J.*, 27.4.53, **51** (51), 293.—A thermal cracker is used to decompose the organic chlorides. The conducting soln produced is passed through a conductivity recorder connected to an alarm system. A diagram is given. G. A. C.

1392. Infra-red analyzers improve processing operation. D. E. Berger. *Oil Gas J.*, 20.4.53, **51** (50), 136.—A description is given of the use by Phillips Petroleum Co. of on-stream analysers in the cat dehydrogenation of butylenes and in the separation of *iso*butane from normal butane by fractionation. G. A. C.

1393. Patents. U.S.P. 2,628,499 (16.5.49; 17.2.53). L. D. Kleiss, assr to Phillips Petroleum Co. Fluid velocity responsive regulating or indicating device.

U.S.P. 2,628,500 (16.9.48; 17.2.53). R. R. Johnson, assr to Standard Oil Development Co. Apparatus for indicating the level of a fluid in a process vessel.

U.S.P. 2,629,790 (U.K. 7.10.50; 24.2.53). J. W. Laing and P. E. Starnes, assrs to John Laing and Son Ltd. Apparatus for measuring and controlling the consistency of a paste or slurry. J. M. S.

Ger.P. 860,721, 6.11.52. H. Ziegler and H. Caspar, assrs to Askania-Werke A.G. Liq level indicator, *e.g.*, tank content meter.

Ger.P. 860,722, 6.11.52. H. Gerwig, assr to Bad. Anilin- & Soda-Fabr. Liq level indicator.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 865,812, 18.12.52. A. Kirschner, assr to A. Karchner. Flowmeter.

Ger.P. 865,816, 18.12.52. A. Stange and F. Guder, assrs to Vereinigte Werkstätten Wittenau G.m.b.H. Device on measuring pans of gas meters to reduce errors.

Ger.P. 866,255, 24.12.52. A.G.f. Stickstoffdünger Knapsack. Process and device for determining filling degree of a container charged with pulverulent, granular, or liq substance.

Ger.P. 866,409, 24.12.52. O. Falk and H. Caspar, assrs to Askania-Werke A.G. Device for measuring sp. gr. of liq stored in stationary tanks.

Ger.P. 865,378, 18.12.52. G. Gasch and G. Schmiechen. Safety pipette.

Ger.P. 867,920, 8.1.53. T. van der List, assr to Ruhrchemie A.G. Device for continuous gas sampling from pipelines.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 868,219, 15.1.53. C. Hardebeck, assr to Rota Apparate- & Maschinenbau. Flowmeter.

Ger.P. 868,220, 15.1.53. C. Hardebeck, assr to Rota Apparate- & Maschinenbau. Quantity controller.

Ger.P. 868,359, 15.1.53. W. Penz, assr to Bergedorfer Eisewnerk A.G. Device for limiting a definite liq flow. (Addn. to P. 864,746.)

Ger.P. 868,360, 15.1.53. R. Kretschmer, assr to Bergedorfer Eisenwerk A.G. Quantity controller for liq.
BrennstChemie, 1953, **34** (3–4). R. T.

PRODUCTS

Chemistry and Physics

1394. The importance of chemistry in the petroleum industry. C. Padovani. *Riv. Combust.*, Feb. 1953, **7** (2), 41–73.—Statistical data on the development of the petroleum industry, particularly in the U.S.A. are discussed. The delaying and the secondary circumstances in the intervention of chemistry in the petroleum industry are stressed. Quantitative and qualitative progress of the automotive industry has forced pet scientists to provide new and more efficient refining and upgrading processes for high grade motor fuel production. The recent trends towards cat *vs* thermal processes in pet refining are also emphasized, together with the development of solid fluid techniques in catalysis. Other processes actually used by pet refining industry (alkylation, polymerization, isomerization, etc.) and by petrochemical industry are discussed.

Forecasts on the development of pet technology point to an increasing intervention of chemistry in petroleum and natural gas industry. (Author's Summary.)

1395. Net heat of combustion of petroleum hydrocarbons. R. S. Fein, H. I. Wilson, and J. Sherman. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 610–14.—Heats of combustion were determined for a number of engine fuels, in particular aviation fuels. Results were correlated as graphical plots of heat of combustion *vs* aniline-gravity constants and characterization factor-gravity constants. It is suggested that such empirical methods give heating values of aviation fuels accurate enough for most engineering purposes. E. J. C.

1396. Constitution of activated clays. I. Perrin-Bonnet and J. Méring. *Chim. et Industr.*, 1953, **69**, 459–60.—Acid treatment of montmorillonite removes R_2O_3 (R = Al + Fe), finally leaving amorphous silica. By use of benzidine to ppt a colloidal portion of the mineral present in the NaOH extract of the amorphous silica, the soluble silica content can be determined. Acidity determinations on activated clay show that this falls with increasing extraction of R_2O_3. Such acidity decrease may, however, only be a surface effect. V. B.

1397. Urea and thiourea adducts and their utilization. W. Schlenk. *Chim. et Industr.*, 1953, **69**, 454–8.—Mechanism of adduct formation is outlined and examples of separation given. By filtration of adduct formed by urea with *n*-octane, in mixture thereof with *iso*-octane, 80% enrichment of latter is obtained; low temp (0° C) favours adduct formation. Substances not forming adducts with thiourea (*e.g.*, *n*-paraffins, benzene) can, however, be entrained and thus diminish separation sharpness. Combined treatment with urea and thiourea can be used, *e.g.*, in analysis of ozokerite, which is thus separated into 4 fractions (adducted by urea alone, by thiourea alone, by neither, by both). From these results, deductions as to ozokerite composition are made (very approx 60% paraffins (mainly *n*) of mean size C_{35}, 20% *cyclo*paraffins, 20% condensed cyclic systems). V. B.

1398. Principal data concerning chemical carcinogenic factors. R. Truhaut. *Chim. et Industr.*, 1953, **69**, 129–41, 317–29.—Review. Carcinogenic activity of chemicals; classification of inorganic carcinogens; principal theories concerning carcinogenic activity; carcinogenic factors in naturally occurring substances. Bibliography of 188 refs (mostly since 1947, earlier bibliographies cited). V. B.

1399. P.V.T. relationships of N_2 and C_2H_4 mixtures at high pressure. W. P. Hagenbach and E. W. Comings. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 606–9.—Apparatus, procedure, and results reported for the above at 50° C and 1 to 468 atm. E. J. C.

1400. Viscosity, thermal conductivity, and specific heat of nitrogen at elevated pressures and temperatures. I. Granet and P. Kass. *Petrol. Refin.*, 1953, **32** (3), 149–50.—The third of a series on high temp–high pressure properties of gases, the most recent data being correlated and presented in graphical form. R. D. S.

1401. Liquid–vapour equilibrium relations in C_2H_6–H_2S system. W. B. Kay and D. B. Price. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 615–18.—Data reported on above system over the range 200 to 1300 p.s.i. This is of interest in the processing of natural gas or crude oil containing large quantities of H_2S. E. J. C.

1402. Phase-equilibrium properties of system CO_2–H_2S. J. A. Bierlien and W. B. Kay. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 618–24.—Data presented on above system over range 0° to 100° C and 10 to 90 atm. E. J. C.

1403. Some properties of mixed paraffinic and olefinic hydrates. H. H. Reamer, F. T. Sellick, and R. H. Sage. *J. Petrol. Tech.*, Aug. 1952, **4** (8), *AIMME Tech. Paper No.* 3376, 197–202.—The effects of temp on the 3-phase pressure associated with the propane–water and propene–water systems when hydrates are present have been examined. The apparatus and methods are described. Ethane–water and ethene–water systems were also studied, and a limited series of measurements was made on the propane–propene–water system. The data from the latter studies

showed that the mixed hydrates began to decompose under isobaric conditions at a temp between that corresponding to the decomposition of pure propane hydrate and of pure propene hydrate. Good agreement was found between experimental and calculated 3-phase pressures for this system. G. D. H.

1404. Water channel analogue to high-velocity combustion. A. K. Oppenheim. *J. appl. Mech.*, 1953, **20**, 114.—Sequel to previous paper (*J. Appl. Mech. Trans. ASME*, 1952, **74**, 63–71), which showed that, in the development of detonation, the combustion zone which appears initially in a unidimensional flow field as a single discontinuity is transformed into an unsteady double discontinuity system, and demonstrated that such change is necessary because of the restrictions imposed on the system by the dynamic boundary conditions. In the water channel the combustion-front discontinuity is simulated by a unidimensional source formed by admitting water from the bottom. By a proper selection of state parameters, analogous relationships to those between pressure and sp. vol. in a gaseous combustion system are derived. Thus, the consequences of restrictions imposed by dynamic boundary conditions on the propagation of combustion are illustrated, also, the analogue is utilized as an illustrative model of a system where controlled, stationary detonation could be achieved. L. G. H.

1405. Patents. Ger.P. 861,689, 13.11.52. O. Brücke, assr to Metallges. A.G. Process and plant for liq mixing, *e.g.*, oils, fats, mineral oils, paraffins, etc., with steam, air, or other gases or vapours.

Ger.P. 860,867, 6.11.52. G. Wagner. Plant for liq or gas mixing. *BrennstChemie*, 1952, **33** (23–4).

Ger.P. 868,601, 15.1.53. W. Fulda and G. Bauermeister, assrs to Vereinigte Aluminium-Werke A.G. Process for dehydrating $Al(OH)_3$.

Ger.P. 869,425, 22.1.53. H. Schaefer, assr to Atlas-Werke A.G. Mass spectrometer for observing gases or gas mixtures, *e.g.*, leaks in vac apparatus. *BrennstChemie*, 1953, **34** (3–4). R. T.

Analysis and Testing

1406. New subzero tool oil developed. H. C. Plummer. *Petrol. Engr*, Jan. 1953, **25** (1), C18.—A new low temp oil is announced as a lubricant for use in pneumatic tools, where water or wet air is present. Lubricants are serviceable in range 40° to −50° F. Test methods and specifications are given. G. H. G.

1407. Principles of laboratory fractional distillation. Practical designs. P. Jaulmes. *Chim. anal.*, 1953, **35**, 57–64, 82–90.—Basis of simple dist (no column) and fractional dist (with column) is outlined, and factors to be considered in column design discussed. Methods for testing column efficiency are explained, aq acetic acid or alc ester soln are suitable liq. Various types of column, packing, and reflux control are described and illustrated. V. B.

1408. Note on laboratory spinning band column design. A. Crozier, L. Robert, and J. C. Rousseau. *Rev. Inst. franç. Pétrole*, 1953, **8**, 79–81.—Constructional details of a 110-cm high, 8-mm-dia column which can be affixed to flasks of 80 to 750 ml capacity. At 60 ml/hr the number of theoretical plates is 24·5 to 38 as r.p.m. of band increases from 1000 to 4000. Charge dist can be as low as 10 ml. V. B.

1409. Indirect titrimetric sulphur estimation and its use in fuel analysis. W. Radmacher and P. Mohrhauer. *BrennstChemie*, 1953, **34** (3–4), 33–7.—Conventional methods for S determination in fuels are examined critically. A modification of L. W. Andrews' chromate process has been evolved, which is rapid and reliable for estimating sulphate ions in fuels. Conditions adopted for the barium chromate pptn avoid co-pptn of chromate ions and blank determinations. Check analyses with H_2SO_4 determine ideal pptn conditions. The influence of foreign ions was investigated. Conventional gravimetric estimation of total, bomb, pyrites, and sol sulphate S is

shortened by using the chromate titration. The method can be used in connection with a potentiometric estimation of Cl-ions. Data are tabulated. 16 literature refs. R. T.

1410. Determination of sulphur in the presence of halogens. R. R. Jay. *Petrol. Engr*, Jan. 1953, **25** (1), C49.—The method is specially applicable to the analysis of leaded gasolines containing halogens as lead scavengers. A correction for halogen interference is made, either by titration with silver nitrate or by calculation based on T.E.L. content. Alkalimetric method is preferred to the gravimetric method, now used to determine the amount of sulphuric acid formed in the absorber of the lamp method.

After burning the sample, the absorbent solution is washed free of CO_2 and titrated with NaOH to the methyl-red end point. Using potassium chromate indicator, the soln is immediately titrated with silver nitrate. Results of the comparative methods are given. G. H. G.

1411. On the viscosity of binary liquid mixtures. F. W. Lima. *J. phys. Chem.*, 1952, **56**, 1052.—A formula for the visc of binary liq mixtures as a function of the visc and density of pure components and the density of the mixture is proposed. It applies to binary mixtures of many organic liq and accounts for the presence of the minima found in the graph of viscosity *vs* concentration; it also applies when there are large differences in the visc of the pure compounds. L. G. H.

1412. Rapid determination of ash content in petroleum products. B. Zaletel. *Nafta (Yugoslavia)*, Feb. 1953, **4** (2), 48–9.—A procedure is described for the rapid determination of ash content in pet products, which is applicable to any kind of crude, especially those with a high water content.

A special apparatus was constructed in which the crude is evaporated without burning, directly from a weighed crucible with the aid of hot gases. Suction through a hood, which is placed over the crucible forces the gases produced by the burner to pass downwards over the inner walls of the crucible and to fall on the surface of the crude. Thus, the creeping and overflowing of the crude over the edges of small crucibles can be prevented, and the evaporation can proceed much faster and without foaming. The results are in good agreement with those obtained by the standard IP 4/44 and ASTM (D 482–58T, 1951) methods. (Author's Abstract.)

1413. Four viscosity standards changed. Anon. *Petrol. Process.*, 1953, **8** (4), 525.—Adoption by the U.S. Bureau of Standards of a new and more precise value for the kinematic viscosity of water has resulted in revisions in 4 ASTM viscosity standards. These revisions are to be established on 1 July, and include the following major changes: (1) the kinematic viscosity of water at 68° F will be 1·0038 centistokes; (2) all kinematic viscosities will be reduced by 0·318%; (3) all kinematic viscometers must be re-standardized or re-calibrated. The estimated accuracy of this new determination of the kinematic viscosity of water is $\pm 0{\cdot}000003$ poise. J. W. H.

1414. The quality control testing of floor varnishes. B. Andersson. *J. Oil Col. Chem. Ass.*, May 1953, **36** (395), 223.—The quality of floor varnishes can be assessed by the following properties: drying time, abrasion resistance, extensibility, washability, paleness, and non-volatile content. The methods used are described. Comparative tests were made to correlate the results of laboratory tests and the properties of varnishes under practical conditions. Results are tabulated. D. K.

1415. The determination of the oil content of putty. K. A. Lammiman. *J. Oil Col. Chem. Ass.*, May 1953, **36** (395), 256.—Established methods of determining the oil content of putty are reviewed, and a new method is described. The new procedure consists of heating under reflux with ether, filtration through a sintered glass filter, removal of ether, and weighing. The procedure was found to be simple, fairly rapid, and gave consistent results. D. K.

1416. Patents. U.S.P. 2,604,392 (2.6.47; 22.7.52). C. W. Brown, assr to Socony-Vacuum Oil Co. Apparatus for determining automatically, and with a greater degree of accuracy than hitherto, the aniline points of pet products over a wide range of colours

in which the clouding and clearing of the mixture below and above the critical temp or aniline point is used to control automatically the internal heating and/or cooling of the mixture, while it is being stirred to bring it to, and keep it at, the critical temp. This is effected by projecting light from a source on to the mixture, the transmitted light falling on a photoelectric cell, the current produced being used to operate a relay system which controls the heating or cooling of the test sample, and is operated periodically as the sample clears or clouds with slight changes in temp.

U.S.P. 2,603,964 (31.3.49; 22.7.52). G. M. Foley and R. H. Cherry, assrs to Leeds and Northrup Co. Apparatus for measuring the content of a paramagnetic gas (oxygen, nitric oxide, nitrogen dioxide) in a gas mixture in which an elongated temp-sensitive resistor is disposed lengthwise of a tubular gas cell and with the longitudinal axis offset or displaced from a surface defined by the lines of the field of max density between pole faces disposed on opposite sides of the cell and extending lengthwise thereof. Due to the heating effect of the resistor and cooling effect of the cell walls, gas entering the cell circulates in loops of width corresponding with the length of the resistor, the paramagnetic components in the cooler portions of each loop being pulled toward the region of highest flux density, and thus increase or decrease the circulation rate according as the pole pieces are above or below the axis of the resistor.

U.S.P. 2,603,965 (U.K. 7.10.48; 22.7.52). E. S. Medlock, assr to Leeds and Northrup Co. Paramagnetic gas analyser of the kind in which the gas is passed through a cell, where it is subjected to localized heating in the presence of a magnetic field to induce a flow of gas in dependence upon change of susceptibility due to heating, wherein correction means are provided to eliminate the specific heat and viscosity effects. V. P. P.

U.S.P. 2,627,745 (16.6.50; 10.2.53). R. Matteson, assr to California Research Corpn. Fl. pt. apparatus.

U.S.P. 2,628,494 (25.10.50; 17.2.53). F. R. Wilson. Device for testing the f.p. of an antifreeze solution. J. M. S.

Ger.P. 868,081, 8.1.53. E. H. Caupeil, assr to Atel. Fabr. Pyrométr. Apparatus for analysing a gas mixture.

Ger.P. 865,384, 18.12.52. Drägerwerk, H. and B. Dräger. Process for detection of benzene in gases.

Ger.P. 865,672, 18.12.52. G. Riedel, assr to Siemens-Schuchertwerke A.G. Apparatus for electronic-optical quant and qual determination of solid or liq constituents in air or other gases.

Ger.P. 866,264, 24.12.52. F. Lieneweg, assr to Siemens & Halske. Testing procedure for magnetic oxygen meter.

Ger.P. 865,674, 18.12.52. H. Petrovicki and F. Schaffernak. Testing instrument for lubricants and motor fuels.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 869,428, 22.1.53. H. Spies, assr to Concordia Elektr. A.G. Gas indicator, *e.g.*, fire damp indicator with temp adjustment.

Ger.P. 869,430, 22.1.53. E. Turowski and F. Klauer, assrs to Auergesellschaft A.G. Measuring instruments for magnetic analysis of materials, *e.g.*, gas mixtures.
BrennstChemie, 1953, **34** (3–4). R. T.

Crude Oil

1417. Oil in peace and war. A. C. Hartley. *Advanc. Sci., Lond.*, March 1953, **9**, 355–67.—Brief surveys are given of the early history, origin, prospecting, drilling, and production of crude oil. Oil refining, loading, oil in war, and pipelines are briefly described. Operations " Pluto " and " Fido " are extensively described and illustrated by 11 photographs, and flame weapons are briefly covered. W. H. C.

1418. The importance of amortization in the exploitation of crude oil and gas. D. Kocakov and R. Sernec. *Nafta (Yugoslavia)*, Feb. 1953, **4** (2), 50–9.—The general significance and factor affecting the amortization expenditures in the exploitation of crude

oil and gas are discussed. The necessity of carrying out thorough calculations of amortization expenditures is stressed, and factors are indicated which can cause financial losses because of lowering of physical properties and exhaustion of the raw materials being mined. (Authors' Abstract.)

1419. True nature of technical tar oils. H. G. Franck. *BrennstChemie*, 1953, **34** (3–4), 37–45.—Quant estimation of the chief constituents of tar oils includes analytical dist in special columns with simultaneous determination of set. pt. curves of the dist. Owing to high m.p. of the compounds, the dist contains chiefly solid, partly high solidifying fractions. *Ca* 10,000 constituents are present, 243 have been identified chemically. Tar oils contain only small quantities of pure oils, thus the liq aggregate condition of tech oil is determined essentially by mutual m.p. depression of the constituents, as shown by means of 60 binary set. pt. diagrams. 3 types of binary set. pt. curves are presented and discussed. The relationship between difference of set. pt. of the components and eutectic min in binary set. pt. diagrams is discussed. The oils are considered as multicomponent eutectics. Composition limits freedom from sediment, but improvements are made by solution aids or pressure treatment with acetylene. R. T.

Gas

1420. Major natural gas conservation project. P. J. Thompson. *Petrol. Engr*, Jan. 1953, **25** (1), C5–12.—The project is another step to conserve natural resources by the oil and gas industries. Separate processes of gas gathering, absorption, stabilisation, dist, and fractionation are dealt with, and details of plant equipment given. New equipment installation in this plant is a combination hydraulic drive and pumping unit. G. H. G.

1421. Sample grading method of estimating gas reserves. D. L. Katz, C. E. Turner, R. D. Grim, J. E. Elenbaas, and J. A. Vary. *J. Petrol. Tech.*, Aug. 1952, **4** (8), *AIMME Tech. Paper No.* 3374, 207–12.—In the South Hugoton gas field, production is from a thick section of the Permian dolomite, but this dolomite shows substandard variations in porosity and permeability. The production history was insufficient for estimating reserves by pressure decline, and the electric logs did not define porosity sufficiently well for reserve estimates. A group of geologists was therefore trained to estimate porosity from the appearance of the dolomite under a 12-power magnification microscope. The training was based on the examination of chips from cores tested for porosity and permeability. 7 porosity grades were defined. The assigned grade for a 10-ft interval was the weighted average of all visible grades of porosity in the cuttings from that interval. Samples from 762 wells were examined.

A porosity–permeability relationship was established from 2077 core plugs from 20 wells. Air permeabilities were measured. These core plugs were also graded by the geologists, and plots show the general correctness of their estimates.

Connate water was estimated from capillary pressure measurements on 179 core plugs spread over the full range of permeability. Tests were made at 40 p.s.i.a. and a plot of permeability against water saturation was drawn. Data for plugs of permeability less than 0·03 mD were rejected on the grounds that such rock was unlikely to yield gas to a well in a reasonable time.

The effective porosity was determined from the preceding data, and the ultimate recovery for each % of this porosity was computed from the reservoir pressure, the abandonment pressure, reservoir temp, and the appropriate compressibility factors. G. D. H.

1422. Recent trends and developments in the natural gasoline industry. J. F. Lynch. *Petrol. Engr*, Jan. 1953, **25** (1), C3–4. (*California Nat. Gasoline Assoc.* (*Oct.* 1952)).—The need to produce more material more cheaply, especially in the LP-gas range, is stressed. 2 main points outlined are the need for better results from contractor engineers, and attention to engineering physics, with particular respect to extraction and separation. G. H. G.

1423. Survey of natural gas fields processing plants. Anon. *Oil Gas J.*, 27.4.53, **51** (51), 214.—Plants and installations producing, and those not producing, LP gases are listed by states. G. A. C.

1424. Mothballing a gas plant. R. Sneddon. *Petrol. Engr*, Jan. 1953, **25** (1), C14–17. —" Mothballing " refers to the preserving of a plant for future use. Details of plant are given, and methods of preservation and storage outlined. G. H. G.

1425. Patents. U.S.P. 2,603,309 (France 3.4.48; 15.7.52). E. Mercier and M. Ehlinger, assrs to Moore Inc. Apparatus for removing dust from gases. The gases are led into the apparatus at high speed as a thin layer (*ca* 1 cm thick or less) and led out as a thin layer of the same thickness after a substantial and abrupt change of direction (*ca* 180°) has been imposed on the flow of gas, the mean radius of curvature of the bend being small, *e.g.*, 1 cm or less, whereby dust particles are hurled to the outside of the bend.

U.S.P. 2,604,184 (1.12.48; 22.7.52). P. W. Warburton and F. W. Morley, assrs to Westinghouse Electric Corpn. A small electrostatic precipitator which can be used alone for cleaning a small volume of gas or in multiple for cleaning any desired larger volume of gas.

U.S.P. 2,604,183 (1.10.48; 22.7.52). E. L. Richardson, assr to Westinghouse Electric Corpn. A simple, inexpensive collector cell for an electrostatic precipitator, comprising a plurality of spaced collector plates of flexible sheet insulating material coated on their adjacent surfaces with a conductive material for forming electrodes, the ends of the plates being attached to similar flexible sheets of insulating material. The cell may be made collapsible as for storage. V. P. P.

Ger.P. 869,526, 22.1.53. F. Walter, assr to Knapsack A.G. Acetylene generator. *BrennstChemie*, 1953, **34** (3–4). R. T.

Engine Fuels

1426. Alcohol power fuels. H. Schildwachter *et al.* *BrennstChemie*, 1952, **33** (23–4), 397–410.—A comprehensive investigation of the properties of binary and ternary mixtures of gasoline, benzene, and pure alcohol, chiefly ethanol, as motor fuels. Questions dealt with are: (1) miscibility; (2) mixing ratio; (3) water absorption; (4) separation and freezing up on refuelling; (5) corrosion; (6) solvent capacity for varnishes; (7) volatility; (8) vapour locking; (9) azeotrope formation; (10) starting behaviour; (11) stability in storage; (12) resin formation; (13) inhibitors; (14) motor performance; (15) fuel consumption; (16) O.N.; (17) cal. val.; (18) general combustion properties; (19) cooling effects due to high heat of vaporization; (20) antiknock properties; (21) T.E.L.; (22) engine wear; (23) economic considerations. Brief reference is made to aeroplane fuels. For binary mixtures $\geqslant 20$ % wt and for ternary mixtures $\geqslant 25$ % wt ethanol is recommended. Numerous graphs and tables are presented. R. T.

1427. Formation of the carburretted mixture and startability. M. du Parquet. *Rev. Inst. franç. Pétrole*, 1952, **7**, 425–34; 1953, **8**, 17–23, 47–67.—Previous work on startability of gasoline engines is reviewed, and an account given of research carried out by the " Claude Bonnier " establishment. Trials (bench) were made with a Simca 5 engine, using both gasolines and various pure compounds. Criterion of startability was sustained running (no load) within 50 starter revs (<10 sec). Factors (in order of importance) affecting startability are: mixture richness (defined as ratio mass fuel present to that strictly required for all O_2 and fuel present to be converted to burnt gas) which should be 2 at normal temp and 3 at $<0°$ C; lub visc; ignition voltage (not critical provided it is 10 V or over for 12-V circuit); starter speed. Startability order of fuels examined (with temp below which satisfactory starting could not be obtained) was: acetone ($-5°$ C); gasoline ($-4°$ C); benzole (0° C); ethyl acetate (7° C); *n*-heptane (9° C); *iso*-octane (13° C); ethanol (15° C); methanol (16° to 22° C); *n*-octane (15° to 21° C). Second portion of the paper is a critical study of the bibliography on this subject (54 refs), from which it is concluded that the basing of startability on vaporization in the induction manifold leads to the use of excessively

rich mixtures, and that vaporization within the cyl should be studied. Such tests, described in the third portion, were made with methanol and ethanol, the higher lat. ht. of vaporization of these as compared to hydrocarbons making experimental investigation of temp changes easier. Tests were carried out on modified CFR engine fitted with special cathode-ray oscillograph pressure recorder and resistance thermometers, and details of equipment are given. Engine was operated at four C.R. (5·4, 6·9, 8·4, 9·75) and temp readings in induction and exhaust manifolds and cyl were taken, together with pressure, air, and fuel quantities. Motor was run without ignition, using air alone, then fuel at theoretical richness and at double such richness. Friction heat developed in engine has important influence on mixture temp. Among the general conclusions is that average volatility of fuel, as distinct from proportion of light fractions which may merely largely offset heavy ends, may have more importance than hitherto thought. V. B.

1428. Methods of evaluating the tendency of kerosine to form deposits. G. Costantinides, M. Dalla Torre, and S. Rotteri. *Riv. Combust.*, March 1953, **7** (3), 122–32.—A method is proposed for the evaluation of the behaviour of kerosine as tractor fuel, with reference to deposit formation in preheating system and on spark plugs.

The validity of the proposed method has been confirmed by an extensive series of tests carried out on practical scale.

Correlations between kerosine composition and engine behaviour are also discussed. (Authors' Summary.)

1429. The oxidation, decomposition, ignition, and detonation of fuel vapours and gases. Pt. III. Nuclear ignition as illustrated by the characteristics of compression and spark ignition; pentane, hexane, and heptane as engine fuels. R. O. King, E. J. Durand, A. B. Allan, E. J. T. Hansen, and V. E. Bowen. *Canad. J. Tech.*, 1952, **30** (9), 222–57.—Experiments were made with a CFR carburettor type engine, described in pts XIX and XX (Abs. Nos. 2152 and 2153, 1952). The conditions adopted as standard and the arrangements made to provide them are described in Pt XIX. The most important are: (1) subnormal charge density; (2) an engine speed of 400 r.p.m.; (3) jacket coolant at 95° F inlet, 100° F outlet; (4) spark ignition, when used, 10° in advance of t.d.c.; (5) air supply to carburettor 50° F; and (6) C.R. always adjusted to obtain max power outputs. In these special conditions C.R. could be raised to obtain auto-ignition before t.d.c., and the engine run as a compression ignition machine. Characteristics of compression by ignition are in agreement with those obtained by comparable experiments on the MIT single stroke rapid compression machine. The method for obtaining optimum C.R. is described in some detail. With nearly normal varieties of hexane, heptane, and pentane the graphs showing the variation of optimum C.R. with mixture strength were always of the W form, similar to those given in Pt XIX for acetaldehyde and diethyl ether. The fact that thermal efficiencies depart from ideal is explained by the endothermic decomposition reaction required to provide nuclei of ignition during the compression stroke. Pressure–time indicator diagrams show that, for optimum C.R., max combustion pressure occurs at 10° after t.d.c., and that combustion occurs in 2 stages. The 2 stages are shown more clearly by a dp–dt diagram. For nearly correct mixtures, combustion takes place in 1 stage. These results were obtained with blank steel plugs in place of sparking plugs. When 1 steel plug was replaced by an unfired sparking plug it was found that, for mixtures richer than about 30% weak, the optimum C.R.s were substantially reduced. This reduction was attributed to preferential decomposition adjacent to the sparking plug core. Spark ignition failed for mixtures weaker than 40% weak with the spark timing varied from 20° to 5° in advance. Compression ignition succeeded spark ignition for these weak mixtures as long as the compression ratio was raised to at least that of optimum C.R. Special experiments for which power was supplied to maintain speed when b.h.p. became less than zero showed that ignition by compression occurred even when the mixture was leaner than 93% weak. The developing of a brown colour on the cooler parts of the combustion chamber was found after very short running time. It is claimed that, as a similar colour was formed in the MIT machine using a hydrocarbon fuel, the deposit could not be due to decomposition of lub oil. After some hours running on a weak mixture the colour became a definite granular deposit, which appeared to have a resinous nature, indicating aldehyde condensation products,

but also contained a little carbon. On increasing the mixture strength the deposit became entirely carbon. With the conditions of low heat load in these experiments, decomposition and oxidn reactions occur mainly in the gaseous phase. When the heat load was increased, by raising the jacket coolant and mixture temp, the relation between optimum C.R. and mixture strength tends to be represented by a single graph, regardless of whether ignition is by compression, with or without an unfired spark plug, or by spark 10° in advance of t.d.c. A transition occurs from the W to the familiar U form of graph. J. R. G.

1430. Utilization of kerosine stocks for jet fuels by treatment with urea. H. J. Hepp, E. O. Box, Jr., and G. C. Ray. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 112–15.—Urea treatment of kerosines was shown to be a more effective method than dist in producing max quantity of stock which could be used as a blend in the preparation of −76° F f.p. jet fuels. E. J. C.

1431. Mixing and distribution of liquids in high-velocity air streams. J. P. Longwell and M. A. Weiss. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 667–77.—Mixing and distribution of injected liquids in high-velocity air streams are of practical importance in the quenching of hot cracked gases, or the injections of fuel in a ram-jet engine. This can be well described by known principles of turbulent diffusion, but injectors often do not behave as the point sources usually assumed. Equations are developed to account for the non-point character of 2 of these sources and additional techniques presented to allow for wall effects and multi-source injection. Experimental data are shown to agree with predictions, using the above methods. E. J. C.

1432. Production and use of ethyl alcohol as motor fuel. K. R. Dietrich. *Erdöl. u. Kohle*, 1953, **6**, 146–8.—Brief description (flow-sheet) of continuous alc plant, suitable for small distilleries, and operating by pressure saccharification and subsequent fermentation of vegetable crops. Product is azeotropically dehydrated. Utilization of residue (cattle food, antibiotic manufacture) is of importance in economics of process. V. B.

1433. The use of boiler oil in motor ships. Anon. *Mot. Ship*, May 1953, **34** (398), 60.—Several of the 30 papers presented at the conference at Milan of the Congrès International des Moteurs à Combustion Interne, which was devoted entirely to the use of boiler oil in large diesel engines and particularly in motor ships, are summarized. U. M.

1434. Patents. U.S.P. 2,628,189 (15.2.50; 10.2.53). R. J. Hawes, F. M. Miller, and R. H. Stephens, assrs to Tide Water Associated Oil Co. Gas turbine and jet engine fuel, comprising, by vol, 50 to 90% of a pet hydrocarbon fraction devoid of butanes and compounds boiling lower than butanes and having a Reid v.p. of 5 to 12 p.s.i., a dist loss not in excess of 2%, a 90% evaporated point below 350° F and a final b.p. below 600° F, and 10 to 50% of a pet hydrocarbon fraction having a Reid v.p. of zero, a final b.p. below 600° F and a dist loss less than 1·5%, and containing at least 50% of constituents boiling above 400° F. The finished fuel should have a Reid v.p. of 5 to 7 p.s.i., a 90% evaporated point above 400° F, and a dist loss not in excess of 1·5%.

U.S.P. 2,628,895 (29.5.48; 17.2.52). W. S. Murray and J. R. Dyer, assrs to The Indium Corpn of America. Motor fuels for I.C. engines contain indium laurate to inhibit carbon deposition.

U.S.P. 2,629,685 (29.10.49; 24.2.53). W. E. Lifson and W. E. Morris, assrs to Standard Oil Development Co. Aviation gasoline containing 0·5 to 1 vol % of an aromatic extract of kerosine having a 50% dist temp above 400° F and a final b.p. below 575° F and having a kauri-butanol solvent value above 70. J. M. S.

Ger.P. 864,090, 4.12.52. M. Pier and E. Donath, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knockproof gasoline.

Ger.P. 864,091, 4.12.52. M. Pier, E. Donath, and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knockproof motor fuel from gasolines or middle oils.

Ger.P. 863,036, 27.11.52. G. Free and E. Donath, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knockproof motor fuels from gasolines or middle oils or middle oils containing gasoline or heavy oils.

Ger.P. 863,037, 27.11.52. M. Pier, E. Donath, and G. Free, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knockproof petrols.

Ger.P. 861,898, 13.11.52. L. Weber. Water gas production from a mixture of fuels and earths.

Ger.P. 864,307, 4.12.52. W. Linder, assr to H. Koppers G.m.b.H. Method for producing valuable combustible gases from hydrocarbons.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 865,892, 24.12.52. M. Pier, E. Donath, and W. Oettinger, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knockproof petrols.

Ger.P. 865,895, 24.12.52. M. Pier, E. Donath, and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knockproof motor fuels from middle oils.

Ger.P. 864,721, 11.12.52. W. Oettinger and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knockproof motor fuels.

Ger.P. 865,337, 18.12.52. H. Nonnenmacher and W. Oettinger, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knockproof motor fuels.

Ger.P. 867,120, 31.12.52. H. Bähr, assr to Bad. Anilin- & Soda-Fabr. Process for recovering fuel oils from low-temp carbonization or pressure hydrogenation products.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 868,895, 22.1.53. M. Pier and E. Donath, assrs to Bad. Anilin- & Soda-Fabr. Process for improving antiknock quality of H_2-rich gasolines or gasoline fractions.

Ger.P. 869,050, 22.1.53. M. Pier and E. Donath, assrs to Bad. Anilin- & Soda-Fabr. Method for producing knockproof petrol.
BrennstChemie, 1953, **34** (3–4). R. T.

Gas Oil and Fuel Oil

1435. Where residuals are heading. Anon. *Petrol. Process.*, 1953, **8** (4), 521–4.—Residual fuel oil production in the U.S. refineries in 1951 was about 470 million brl; this, together with imports, gave a total supply of residual fuel for the same year of 588 million brl, representing a 20% increase over that in 1946.

No changes in processing methods are in the making in the U.S. which would radically change the vol output of heavy fuel oils. Any reduction in the yield of residuals in the near future will come from the erection of more installations of the conventional processes, such as cat cracking and coking. The price of the residual fuel oil depends on the cost of the competitive fuels, coal and natural gas, to the consumers, and does not depend on the price the refiner sets.

Tables are presented of the annual supply, percentage yield, and total annual domestic consumption of residual fuel oils in the U.S. for the years 1946–51.

J. W. H.

1436. Patents. U.S.P. 2,603,960 (U.K. 17.11.47; 22.7.52). C. G. Nobbs. Liq fuel burner having a plurality of wicks, and means whereby all the wicks can be ignited simultaneously.

U.S.P. 2,603,282 (9.4.47; 15.7.52). G. M. Schueder and H. P. Zimmer, assrs to Evans Products Co. Horizontally discharging pot-type burner.

U.S.P. 2,602,495 (28.10.48; 8.7.52). C. S. Greer, assr to Lonergan Manufacturing Co. Vaporizing pot type burner of the type having opposing segments at or near the floor of the pot defining laterally confined areas, with a space between the segments which acts as a mixing and combustion chamber beginning at the floor at low fire and extending to the top of the pot at high fire. This invention provides an improved vaporizing chamber, which is incorporated in one of the segments and provides a pilot flame for the vaporizing pot in addition to the low flame.

U.S.P. 2,603,959 (13.5.50; 22.7.52). W. B. Engh, assr to Aladdin Industries Inc. Mantle mounting *A* for incandescent mantle lamps in which the burner cone directing outer air to the flame of the burner comprises the base of *A* and also constitutes a centring means *B* for the lower end of the mantle. Combined with *B* and radially spaced from it is an outer annular wall, loosely encircling the lower portion of the mantle, which supports the harp of *A*. Flow of outer air to the mantle is controlled by perforations in the annular wall. The lower portions of the burner cone and annular wall are formed into a single annular and cylindrical flange for mounting purposes on the gallery of the burner. The burner cone and annular wall are formed of thin sheet metal of high thermal resistance to minimize the heat conducted by *A* to the burner gallery. The burner cone is so constructed and located that, in co-operation with the baffle of the burner, it will accurately meter outer air supplied in optimum amount to the flame of the burner and so that, with each mantle renewal, the burner will be supplied with a new burner cone of the same accuracy.

U.S.P. 2,603,279 (8.9.48; 15.7.52). W. P. Pohle, assr to Lynn Products Co. Oil burner head in which a primary air stream is blown through the annular passage between the inner and outer housings and is discharged from the latter with a whirling movement imparted by vanes in the passage. A secondary stream of air is admitted to the inner housing and discharged with a whirling movement, whereby a wide range of rate of fuel consumption is obtainable without adjusting the quantity rate of air flow. A frusto-conical nozzle at the delivery end of the outer housing co-operates with the vanes in the main air passage to cause the main air stream to issue from the delivery orifice in the form of a hollow cone. The inner housing terminates in a similar, but smaller, frusto-conical nozzle parallel to the outer nozzle. Helical air passages within the inner housing cause the secondary air stream to discharge from it as a hollow cone. The fuel nozzle emits atomized oil in a conical spray.

U.S.P. 2,603,280 (19.10.48; 15.7.52). G. Bernhard. Burners for use with heavy cat-cracked fuel oil designed to surround each particle of fuel, immediately it is atomized, with air, and to eliminate the vacuum normally created in front of the nozzle by the Venturi action of the air passing the nozzle.

U.S.P. 2,603,281 (2.5.49; 15.7.52). W. H. Frankland. Vaporizing forced draft oil burner in which fuel is vaporized and mixed with insufficient air for combustion before introduction into a combustion chamber and is then mixed with additional air. The vaporizing chamber is of highly thermoconductive material, and provides, upon initial lighting of fuel oil in the burner, a continuous ring of flame surrounding the chamber to heat the material rapidly to oil vaporizing temperature.

U.S.P. 2,604,148 (28.1.49; 22.7.52). J. Witherspoon, assr to General Electric Co. Fluid fuel burner control apparatus comprising mechanically and electrically interlocked thermal timers connected to lock out and recycling operation, providing a predetermined scavenging time between flame failure and re-initiation of burner operation dependent on the condition of the flame detector when flame failure occurs.
V. P. P.

U.S.P. 2,627,908 (7.8.50; 10.2.53). P. A. Broady. Liq fuel burner of the retort vaporizing type.

U.S.P. 2,627,909 (13.10.48; 10.2.53). J. B. Moore. Air distributing means for pot type liq fuel burners. J. M. S.

Ger.P. 867,847, 8.1.53. M. Pier, E. Donath, and O. Reitz, assrs to Bad. Anilin- & Soda-Fabr. Method for producing motor fuels and fuel oils.
BrennstChemie, 1953, **34** (1–2). R. T.

Lubricants

1437. Pinic acid diesters. C. M. Murphy, J. G. O'Rear, and W. A. Zisman. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 119–25.—Preparation of compounds such as dibutyl pinate, diamyl pinate, dihexyl pinate, etc., is described. Properties of these diesters are tabulated, including viscosity and oxidn and anti-oxidant characteristics. These pinic acid derivatives are suitable for high and low temp lubrication as well as grease manufacture. The compounds have large potential industrial applications.
E. J. C.

1438. New ideas on lubrication. B. Lund. *Mot. Ship*, Apr. 1953, **34** (397), 29. —This article summarizes a thesis presented to the Danish Academy of Technical Sciences in which the author presents some new hypotheses on the subject of sleeve-bearing lubrication. These are: (1) that adhesive films form between the rubbing surfaces, produced by chemical reaction between metal, lubricant, and surrounding atmosphere; (2) that the bearing properties of a metal are determined by its ability to react and form these films, and (3) similarly, the lubrication ability or oiliness of a lubricant is determined by its ability to react with metal and atmosphere. A method of test for the evaluation of metal bearing properties and lubricant oiliness has been developed and is described. U. M.

1439. Foaming of diesel engine lubricating oils. L. M. Tichvinsky. *Rev. Inst. franç. Pétrole*, 1953, **8**, 35–46.—Mechanism of foam formation is briefly reviewed. Tests were carried out using U.S. Federal method VV-L-791 d, 321.1.1 on an SAE 50 base oil and same oil with H.D. additives. Base oil gave reproducible results, but in case of additive-containing oil erratic results were found in temp range 100° to 140° F. Tests on varying various factors (temp, effect of preliminary aeration of oil and time elapsed thereafter, air flow) were made, and it is concluded that preliminary aeration and thermal history of oil greatly influence results. It is suggested that oils be preliminarily aerated at 200° F, prior to foam test, to ensure reproducibility of results. The method is also sensitive to temp (±1° F) and air flow (variations in diffuser permeability) changes. 21 refs. V. B.

1440. Patents. U.S.P. 2,605,278 (6.12.49; 29.7.52). L. A. Mikeska, assr to Standard Oil Development Co. A salt of an organic acid of phosphorus and a base of the formula $RSC(NH)NH_2$, wherein R is an aliphatic, *cyclo*aliphatic, or aralkyl hydrocarbon radical, is added to a lub oil to inhibit carbon and sludge formation.

U.S.P. 2,605,226 (30.11.49; 29.7.52). S. C. Vaughn, assr to Tide Water Associated Oil Co. Mineral lub oil containing the addition product of an amino bi*cyclo*hexyl and C_{8-16} alkyl acid phosphate, as rust inhibitor.

U.S.P. 2,604,453 (30.12.48; 22.7.52). A. H. Popkin, assr to Standard Oil Development Co. Mineral (or synthetic) lub oil of improved V.I. containing 0·1 to 15 wt % (based on total composition) of a copolymer of 80% lauryl acrylate and 20% methyl acrylate, the copolymer having alkyl side chains of an average length of 7·5 C atoms.

U.S.P. 2,605,225 (5.9.51; 29.7.52). E. L. Armstrong and R. A. Butcosk, assrs to Socony-Vacuum Oil Co. Grease comprising a mineral lub oil, a thickener, and sufficient of a carboxylic acid type ion-exchange resin to stabilize the grease to oxidn. V. P. P.

U.S.P. 2,627,511 (30.8.50; 3.2.53). A. R. Jones and J. O. Smith, assrs to Standard Oil Development Co. Antioxidants for mineral oils are obtained by reacting an aryl sulphonyl halide with an alkali metal mercaptide containing 5 to 30 carbon atoms.

U.S.P. 2,627,528 (10.8.50; 3.2.53). H. L. Coonradt, B. W. Rope, and A. N. Sachanen, assrs to Socony-Vacuum Oil Co. Compounds of the formula

$$\begin{array}{l} CH_2\text{—}CH\cdot(CH_2)_nCH_3, \text{ wherein } n \text{ is from 11 to 19, are lubricants.} \\ | \quad\quad | \\ CF_2\text{—}CF_2 \end{array}$$

U.S.P. 2,627,938 (10.8.48; 10.2.53). S. E. Frohmader and V. C. Archer, assrs to Research Products Corpn. Thixotropic compositions, comprising a pet oil and polyethylene.

U.S.P. 2,628,195 (23.9.49; 10.2.53). J. R. Allison and W. L. Blalock, assrs to Leffingwell Chemical Co. Lubricating grease made by dissolving stearic acid and 2-ethylhexanoic acid in a mineral lub oil, mixing with this solution a small proportion of water and a hydroxide or carbonate of aluminium, barium, calcium, magnesium, strontium, or zinc, and evaporating off the water. The soap of 2-ethylhexanoic acid present in the grease should be 1 to 35% of the total soap.

U.S.P. 2,628,196 (10.8.50; 10.2.53). H. L. Coonradt, B. W. Rope, and A. N. Sachanen, assrs to Socony-Vacuum Oil Co. Mineral lub oils containing the organo fluorine compounds described in U.S.P. 2,627,528.

U.S.P. 2,628,197 (17.8.50; 10.2.53). R. B. Killingsworth, assr to Socony-Vacuum Oil Co. Cutting oil emulsion, comprising a mineral lub oil dispersed in water, an oil-in-water type emulsifier, and an organophilic bentonite having a hydrocarbon chain of at least 10 carbon atoms.

U.S.P. 2,628,198 (31.3.51; 10.2.53). E. Arundale and F. W. Banes, assrs to Standard Oil Development Co. Lub oils having a visc of 35 to 800 S.S.U. at 210° F containing 0·01 to 20% of a C_8 to C_{20} alkyl maleate-vinyl acetate copolymer having an average mol. wt. of 7000 to 25,000. The copolymer used is prepared in the presence of an inert organic solvent, a peroxide cat, a ferric salt of a long chain fatty acid, and benzoin, acetal, diacetone alcohol, diacetyl acetone, or acetonyl acetone.

U.S.P. 2,628,202 (23.9.49; 10.2.53). J. R. Allison and W. L. Blalock, assrs to Leffingwell Chemical Co. Relates to the compound soaps used in the lubricating greases of U.S.P. 2,628,195.

U.S.P. 2,628,205 (21.10.50; 10.2.53). M. J. Shoemaker, assr to Research Products Corpn. Thixotropic compositions comprise mineral oil, polyethylene, and an emulsifier.

U.S.P. 2,628,220 (15.6.51; 10.2.53). E. Arundale and F. W. Banes, assrs to Standard Oil Development Co. Relates to the preparation of the copolymers used as lub oil additives in U.S.P. 2,628,198.

U.S.P. 2,628,887 (6.4.51; 17.2.53). J. J. Perkins, assr to American Sterilizer Co. Surgical instruments are lubricated and sterilized by coating them with an oil lubricant–water mixture and then subjecting them to a steam pressure atmosphere to evaporate the water and leave the instruments coated with a film of lubricant.

U.S.P. 2.628,938 (17.3.50; 17.2.53). W. B. Whitney, assr to Phillips Petroleum Co. Salts of esterification products of hydroxy fatty acids are used as gelling agents in grease manufacture.

U.S.P. 2,628,939 (21.11.47; 17.2.53). E. S. Blake, assr to Monsanto Chemical Co. Wear reducing agents for mineral lub oils are sulphurized and phosphorized dioleates of ethylene glycol, diethylene glycol, or dithiodiglycol.

U.S.P. 2,628,940 (3.2.49; 17.2.53). E. B. Cyphers and W. E. Waddey, assrs to Standard Oil Development Co. An E.P. additive comprising 50 wt % of a reaction product of a chlorinated wax–kerosine mixture with sodium polysulphide, 30 wt % of a P_4S_3-treated sulphurized methylated rosin, and 20 wt % of a P_4S_3-treated sulphurized sperm oil.

U.S.P. 2,628,941 (4.2.50; 17.2.53). D. E. Adelson, G. L. Perry, and G. G. Pritzker, assrs to Shell Development Co. E.P. additives for liq organic lubricants are reaction products of an alkylene oxide, sulphide, or imine containing 2 to 5 carbon atoms with an organic compound containing 1, 2, or 3 free carboxylic acid groups and at least 1 hydroxy group.

U.S.P. 2,628,942 (27.6.51; 17.2.53). J. R. Morris and J. R. Roach, assrs to Texas Co. Detergent additives for mineral lub oils are polyvalent metal derivatives of cyclic imides.

U.S.P. 2,628,949 (14.2.51; 17.2.53). R. A. Butcosk, assr to Socony-Vacuum Oil Co. Lithium base lub greases, in which the liq medium is a lubricant of the synthetic ester type, are stabilized by addition of a lithium salt of a phosphonic or phosphinic acid.

U.S.P. 2,628,953 (30.11.50; 17.2.53). T. H. Newby, assr to United States Rubber Co. 6 : 6′-alkylidene bis-(2-*iso*bornyl-4-methylphenols) are antioxidants.

U.S.P. 2,628,974 (27.3.48; 17.2.53). R. T. Sanderson, assr to Texas Co. Synthetic lubricants formed by reacting an aliphatic dibasic acid of 6 to 20 carbon atoms with ethylene, propylene, or butylene glycol or diethylene or dipropylene glycol, and an aliphatic monohydric alcohol or monocarboxylic acid.

U.S.P. 2,629,691 (19.12.49; 24.2.53). W. H. Peterson, assr to Shell Development Co. Greases prepared from a lub oil, a colloidal metallic oxide gel, and a hydrophobic surface active agent, are improved by heating to 165° to 200° C for 30 to 120 min.

U.S.P. 2,629,692 (13.10.50; 24.2.53). H. J. Liehe, assr to Standard Oil Co. Anhydrous grease comprising a lub oil, an alkaline earth soap of an oil-sol sulphonic acid, and an alkaline earth soap of a fatty material, the soaps being in a ratio between 1 : 2 and 2 : 1.

U.S.P. 2,629,693 (1.7.47; 24.2.53). R. C. Barton, R. F. Bergstrom, and J. M. Plantfeber, assrs to Shell Development Co. Lub oils suitable for use in engines running on high sulphur fuels contain 1 to 4% of a calcium petroleum sulphonate and 0·1 to 1% of phenyl-α-naphthylamine and 2 : 6-di-*tert*-butyl-4-methylphenol.

U.S.P. 2,629,694 (5.7.49; 24.2.53). H. A. Woods and J. A. Edgar, assrs to Shell Development Co. Greases comprising a lub oil, an alkali metal soap, an oil-sol amine, and an oil-sol polyvalent metal salt of an alkyl dithiocarbamic acid.

U.S.P. 2,629,695 (U.K. 13.1.48; 24.2.53). J. B. Matthews, D. Evans, W. D. Carswell and J. F. Hutton, assrs to Shell Development Co. Lithium base greases are made by heating a lub oil and a lithium soap to 210° to 260° C to form a homogeneous composition, cooling to a temp between those of the two lowest phase transformation points occurring above 50° C, isothermally gelling at such temp for 1 to 6 hr, and finally cooling to packing temp. J. M. S.

Ger.P. 863,337, 27.11.52. F. Christmann and H. Bueren, assrs to Bad. Anilin- & Soda-Fabr. Method for lub oil production.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 865,039, 11.12.52. M. Zimmermann, P. Simons, H. Jonas, and W. Noll, assrs to Farbenfabriken Bayer. Lub additive.

Ger.P. 865,038, 11.12.52. O. Wahl and W. Schommer, assrs to Farbenfabriken Bayer. Lub or polishing agent.

Ger.P. 865,174, 18.12.52. W. Klought, assr to Waggonfabrik Uerdingen A.G. Lub resistant to high pressure.

Ger.P. 865,342, 18.12.52. J. Nüsslein, assr to Metallges. A.G. Lub oils capable of being washed out.

Ger.P. 867,271, 31.12.52. E. Terres, K. Fischer, A. Hoppe, and P. Jodeck, assrs to Edeleanu G.m.b.H. Process for obtaining highly viscous oils.

Ger.P. 865,344, 18.12.52. K. Knoll, assr to Siemens-Schuckertwerke A.G. Lub greases resistant to high pressure.
BrennstChemie, 1953, **34** (1–2). R. T.

Bitumen, Asphalt, and Tar

1441. Bitumen emulsions. Anon. *Paint Tech.*, Nov. 1952, **17** (203), 465.—Comment is made on bitumen and tar emulsions and the phenomenon of crazing. Residual pet bitumens are more difficult to emulsify than coal-tar pitch and natural asphalts.
Possible explanations for crazing are discussed. D. K.

1442. Plotting aggregate gradation specifications for bituminous concrete. J. B. Dalhouse. *Publ. Rds, Wash.*, 1953, **27** (7), 155.—All specifications for bituminous concrete include the grading of the aggregate. This specification is usually expressed in one of 2 ways : (1) the total percentage passing each sieve of a series ; (2) a series of percentages passing 1 sieve and retained on the next. It is not easy to compare data expressed in these 2 ways, chiefly because of the difficulty of graphical reproduction of system (2), although experienced engineers may be able to establish a correlation quickly. A method is described where system (2) can be expressed graphically. The two systems are discussed critically and the differences of control enumerated, and their applications to different types of grading are also reviewed. R. H.

1443. Bituminous materials, their processing and use mirrored in recent German patent literature. H. Hoffmann. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (1), 15.—Patent specifications for bituminous materials, appearing since 1950, are classified in 19 groups, and presented in this and subsequent numbers. R. T.

1444. Influence of synthetic rubber on properties of bitumen. T. Temme. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (1), 8–14.—An extensive discussion of investigations on the influence of synthetic rubber powder (butadiene basis), by H. A. Endres *et al*, of Goodyear Tyre and Rubber Co., Akron, Ohio, published in *Ind. Engng Chem.*, 1951, pp. 343 *et seq.* R. T.

1445. Raw materials for composition roofing. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (1), 2–7.—In Pt I basic materials used, felt, rags, paper, etc., and their processing for composition roofing are discussed fully. Bitumens and tars of different origin and properties are considered regarding suitability for steeping and covering media. R. T.

1446. Microscopic research on asphalt solutions. A. P. F. Kist. *Ingenieur, 's Grav.*, 6.5.53, **65** (10), B43–9.—Bright-field microscopic examination of asphaltic bitumen soln has always been unsuccessful as a result of the extreme smallness of the bitumen micelles and the volatility of the solvents. After discussing the principles of dark-field and phase-contrast microscopy, the author introduces a new technique. A quick focusing in semi-dark-field is followed by observation or photomicrography in phase-contrast. The semi-dark-field is obtained by eccentric adjustment of the condenser ring diaphragm. 17 figs and photographs are included. G. F. T. C.

1447. Patents. U.S.P. 2,628,173 (30.10.47; 10.2.53). W. F. Fair, assr to Koppers Co. Coating metal articles with bituminous materials.

U.S.P. 2,628,544 (19.9.51; 17.2.53). H. C. Miller, assr to United States Rubber Co. Joint sealing composition comprising coal tar pitch, a copolymer of 1 : 3-butadiene and acrylonitrile, and carbon black.

U.S.P. 2,629,629 (11.8.49; 24.2.53). G. M. Etnyre. Distributor for bituminous materials.

U.S.P. 2,629,666 (18.5.51; 24.2.53). A. J. Morway and D. W. Young, assrs to Standard Oil Development Co. Rust preventive composition, comprising bitumen thickened with an acylaminophenol.

U.S.P. 2,629,669 (16.3.50; 24.2.53). B. A. Anderton, assr to Allied Chemical and Dye Corpn. Paving mixture, comprising a mineral aggregate, pulverized coal, and a bituminous or tar binder. J. M. S.

Ger.P. 865,457, 18.12.52. H. Ratte and J. Geller, assrs to Rütgerswerke A.G. Process for obtaining carbazole and an anthracene mixture by continuous dist of coal tar.

Ger.P. 866,791, 31.12.52. W. Schulze, assr to Ges. f. Teerverwertung m.b.H. Process for continuous dist of tars containing naphthalene.
BrennstChemie, 1953, **34** (1–2). R. T.

Special Hydrocarbon Products

1448. A type of furnace for the chlorination of methane. F. Zanetti and G. Cevidalli. *Riv. Combust.*, Jan. 1953, **7** (1), 13–20.—In the thermal chlorination of methane, the heat developed by the reactions and total heat capacity of gases must be carefully balanced, to have in the reactor a temp which, although sufficiently high to support the reactions, does not pass the point at which undesirable secondary reactions will occur.

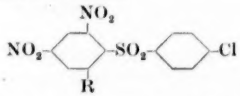
A reactor has been designed in which, by recycling the reacted, hot gases, the temp is maintained at the proper level. (Authors' Summary.)

1449. Relation of smoke point to molecular structure. R. A. Hunt, Jr. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 602–6.—Smoke points of 108 compounds were determined using a Factor lamp. *n*-Alkanes and *n*-alkenes had high values which changed regularly with increasing mol. wt. Branched-chain alkanes had slightly lower values, depending on degrees of branching, and the type and position of branching group. *cyclo*Alkanes showed great variation with mol. wt. and structure, but generally smoke points reduced in the order *cyclo*hexanes, *cyclo*pentanes, unsaturates, and polycyclic ring compounds. Aromatics as a class gave low values, but their 20% mixtures in *n*-dodecane showed significant differences. S and N atoms had only small influence on the values of compounds containing them. It is suggested that factors influencing octane number also influence smoke point. E. J. C.

1450. Influence of different electrode shapes on breakdown voltage of transformer oils. L. Maurer. *Elektrotech. Z.*, 1953, **74**, 225–7.—Comparative tests with electrodes prescribed by VDE 0370/52, ASTM D 113–43, and an intermediate hemispherical design with $r = 100$ mm were made by 3 laboratories. Electrode separation was 2·5 mm and series of oils (new, aged, and artificially contaminated) were examined over breakdown voltage range 6–60 kV. Capacity of test vessels was $\frac{1}{2}$, $1\frac{1}{2}$, and 50 l; in the last case, all 3 electrodes were fitted to same vessel. General test procedure was in accordance with VDE method. Highest breakdown voltage and sharpest fall thereof with decrease in oil quality were shown by VDE electrodes, the ASTM type showing least sensitivity; from 20 kV downwards, all electrodes gave similar results. Thus, VDE electrodes are the most suitable of those examined, despite the somewhat higher scatter of results given by this design. Correct setting of ASTM electrodes is more difficult than for VDE type. V. B.

1451. Patents. U.S.P. 2,604,495 (21.7.48; 22.7.52). E. O. Erkko, assr to Hercules Powder Co. Production of ethylene by contacting ethane mixed with CO_2 with an iron oxide cat, preferably containing ± 1 metal oxide promoter, at 750° to 950° C for <3 sec.

U.S.P. 2,605,277 (21.3.50; 29.7.52). F. E. Boettner and W. J. Croxall, assrs to Rohm & Haas Co. Compounds of formula,



wherein R is a *sec*-alkyl group of 1 to 9 C atoms, are effective parasiticides, particularly against red spider.

U.S.P. 2,601,895 (12.12.46; 1.7.52). O. W. Garretson and C. O. Henneman, assrs to Phillips Petroleum Co. Weed burner adapted to operate on liq fuel or liq pet gases for use in conjunction with horse-drawn or motor-propelled assemblies.

U.S.P. 2,602,684 (21.9.49; 8.7.52). A. H. Pinker, assr to H. D. Hudson Manufacturing Co. Spray boom, having a fixed boom section to which an end boom section *A* is pivotally mounted by hinge means to enable *A* to swing about a horizontal or vertical axis, to be held at any desired angle to the vertical, and to pivot laterally when striking an object. V. P. P.

U.S.P. 2,627,174 (28.10.49; 3.2.53). W. Weglin. The upper part of a candle is made of a number of layers of material which will form coloured drippings, and the wick extends spirally about these layers.

U.S.P. 2,627,471 (1.11.50; 3.2.53). L. E. Dowd, assr to Transparent Package Co. A mixture of paraffin wax and a drying oil fatty acid ester of a epichlorhydrin–bisphenol reaction product is coated on regenerated cellulose packaging material and heated to polymerize and bond it to the said material.

U.S.P. 2,627,479 (5.5.47; 3.2.53). L. Pritzker. A synthetic drying oil is made by heating together at 350° to 600° F a resin, produced by air-blowing at 450° to 575° F the propane pptd viscous material from propane dewaxed cylinder stock, with the unsaturated liq polymer obtained as a by-product in the cracking of pet tars.

U.S.P. 2,627,483 (30.1.51; 3.2.53). L. E. Dowd, assr to Transparent Package Co. Similar to U.S.P. 2,627,471, but any waxy material may be used.

U.S.P. 2,627,487 (11.1.49; 3.2.53). N. L. Drake, W. J. Shenk, and C. M. Eaker, assrs to U.S.A. (Secretary of the Army). The propyl esters of *NN*-diethylsuccinamic acid and *NN*-pentamethylenesuccinamic acid are insect repellants.

U.S.P. 2,627,489 (11.1.49; 3.2.53). N. L. Drake and S. Melamed, assrs to U.S. (Secretary of the Army). 1 : 3-*cyclo*Hexandiol monopropionate is an insect repellant.

U.S.P. 2,627,490 (10.1.49; 3.2.53). P. D. Bartlett, H. J. Dauben, and A. Schneider, assrs to U.S.A. (Secretary of the Army). An insect repellant composition, comprising *N*-*n*-amylacetanilide and a non-toxic insect repellant adjuvant.

U.S.P. 2,628,163 (22.3.51; 10.2.53). D. T. Mowry and W. R. Piesbergen, assrs to Monsanto Chemical Co. Herbicidal composition comprising an oil-in-water emulsion containing mucochloric or mucobromic acid or an alkali metal, alkaline earth metal, ammonium or organic amine salt thereof.

U.S.P. 2,628,170–1 (23.2.50; 10.2.53). L. Q. Green, assr to E. I. du Pont de Nemours and Co. Water-repellency compositions for application to textile fibres from a hydrocarbon solvent comprise a hydrocarbon wax and an organo ester of $Ti(OH)_4$.

U.S.P. 2,628,181 (13.4.49; 10.2.53). D. T. Mowry, assr to Monsanto Chemical Co. 4 : 5-Dichloro-3-pyridazones are used to inhibit growth of fungi and bacteria on plants.

U.S.P. 2,628,187 (6.5.50; 10.2.53). S. H. Frohmader and M. J. Shoemaker, assrs to Research Products Corpn. Medicinal oil containing polyethylene.

U.S.P. 2,628,203 (9.9.49; 10.2.53). C. F. Van Gilder and W. C. Harney, assrs to Standard Oil Development Co. Preparation of solutions of rubbery polymers in wax. Polymer particles of uniform size not over $\frac{1}{4}$ inch in dia are agitated with the molten wax.

U.S.P. 2,628,917 (11.10.49; 17.2.53). T. R. McElhinney and T. D. Woodruff, assrs to Valite Corpn. Microcrystalline pet wax is used in making thermoplastic resins from pinewood pitch. The pitch is reacted with 6% of the wax, 3 to 15% of furfural, and 0·5 to 6% of drying oil by heating under reflux for 45 min at 150° C, followed by dist at 240° to 280° C.

U.S.P. 2,629,655 (26.10.50; 24.2.53). F. L. Stark, assr to American Cyanamid Co. Weed-killing composition, comprising potassium cyanate and potassium or sodium carbonate.

U.S.P. 2,629,681 (20.12.49; 24.2.53). H. M. Hill, assr to Eastman Kodak Co. Thermal decomposition products of pentachloropentadienoic acid are used as insecticides.

U.S.P. 2,629,697 (14.10.48; 24.2.53). W. K. Langdon and E. F. Soop, assrs to Wyandotte Chemicals Corpn. Composition comprising 55 to 71 % wt of kerosine, 12 to 20 % wt of sodium kerylbenzenesulphonate, and 2 to 4 % wt of a monohydric alcohol of 4 to 10 carbon atoms, the monobutyl ether of ethylene, diethylene or propylene glycol, or 2-ethylhexanediol-1 : 3. J. M. S.

Ger.P. 863,942, 4.12.52. W. Gündel and W. Scherff, assrs to Henkel & Cie G.m.b.H. Method for producing highly chlorinated *cyclo*hexanes, effective as insecticides.

Ger.P. 861,248, 6.11.52. H. Ritter, assr to Gelsenkirchener Bergwerks-A.G. Process for obtaining styrene.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 865,894, 24.12.52. M. Pier, E. Donath, and H. Nonnenmacher, assrs to Bad. Anilin- & Soda-Fabr. Method for producing uniform aromatic hydrocarbons.

Ger.P. 867,390, 8.1.53. A. Cantzler, H. Giehne, H. Krekeler, and R. Leutner, assrs to Bad. Anilin- & Soda-Fabr. Method for producing *n*-butylene.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 869,054, 22.1.53. A. Woerner and W. Flemming, assrs to Bad. Anilin- & Soda-Fabr. Method for producing propylene chlorohydrin.
BrennstChemie, 1953, **34** (3–4). R. T.

Derived Chemical Products

1452. Contribution to the knowledge of the synthesis of carbon disulphide from methane and sulphur. G. Cevidalli. *Riv. Combust.*, Jan. 1953, **7** (1), 5–12.—After a short review of the thermodynamical problems connected with the synthesis of carbon disulphide from methane and sulphur, the apparatus used for the study of different cat is described. The sulphur feeder is particularly dealt with.

With some of the cat examined, sulphur conversions of 90% have been obtained, with yields of carbon disulphide quantitative in respect to the reaction :

$$CH_4 + 2S_2 \rightleftarrows CS_2 + 2H_2S$$

(Author's Summary.)

1453. Phthalic acids—petrochemicals of the future. Pt I. Economic importance and the reaction variables. P. W. Sherwood. *Petrol. Refin.*, 1953, **32** (3), 113–17.—Reviews the origins, uses, and relative importance of 3 isomeric phthalic acids as raw materials for synthetic fibres and plasticizers. The production of phthalic anhydride is stated to have quadrupled in the last 10 years. A description of the process is given, covering choice and preparation of the cat and the effects of the reaction variables on the yield from direct air oxidn of naphthalene, or *o*-xylene, in a fixed cat bed.

R. D. S.

1454. Patents. U.S.P. 2,605,290 (11.9.48; 29.7.52). A. E. Robertson and A. R. Jones, assrs to Standard Oil Development Co. Preparation of organic peroxides by oxidizing a straight run pet fraction, b.p. 80° to 190° C, in liq phase at 115° to 165° C, separating the peroxides formed by adsorption on silica gel, desorbing the gel with acetone, reactivating the gel with steam, and recycling the unabsorbed pet fraction.

U.S.P. 2,605,291 (17.7.50; 29.7.52). M. R. Barusch and J. Q. Payne, assrs to California Research Corpn. Preparation of β-hydroxydialkyl peroxides by condensing a 1 : 2-epoxyalkane with an alkyl hydroperoxide.

U.S.P. 2,605,239–40 ((*a*) 23.6.49 (*b*) 12.11.49; 29.7.52). (*a*) G. W. Sears; (*b*) G. W. Sears and W. W. Thompson, assrs to E. I. du Pont de Nemours and Co. Preparation of a Ag–BeO cat, for use in oxidizing ethylene to ethylene oxide, by copptg reducible oxygen compounds of Ag and Be in a wt ratio Ag : Be of (*a*) 10 to 5,000 : 1, (*b*) 5 to 150 : 1, from a soln of Ag and Be compounds and then reducing the coppt. In (*b*) the coppt is first mixed with a separately prepared reducible oxygen compound of Ag ($\lessapprox$25 parts by wt per part of Be in coppt) to give a wt ratio Ag : Be of 100 to 500 : 1, reducing the mixture, and then heating at 350° to 600° C for 3 to 10 hr.

U.S.P. 2,605,292 (9.5.47; 29.7.52). G. J. Shugar and W. D. Paist, assrs to Celanese Corpn of America. Production of butyl ethers of 1 : 4-butanediol by reacting tetramethylene oxide with butyl alcohol at *ca* 260° C/$>$1 atm in presence of fused zinc chloride as cat.

U.S.P. 2,605,241 (Canada 22.11.46; 29.7.52). H. E. Albert, assr to Firestone Tire and Rubber Co. Vulcanisates of natural and synthetic rubbers are reclaimed by heating at $\lessapprox$300° F with *bis*(4 : 6-di-*tert*-butyl *n*-cresol) disulphide.

U.S.P. 2,605,242 (13.7.51; 29.7.52). J. L. Betts, E. A. McCracken, H. J. Rose, and R. E. Wood, assrs to Standard Oil Development Co. Preparation of a coagulation resistant latex having a high concn of solid polymer particles by dispersing 100 parts of a feed containing a C_{4-6} conjugated diolefin in an aq medium in presence of 1 to 10 parts of an alkylated aryl polyether alcohol, 1 to 10 parts of a rosin acid metal soap, and an electrolyte in amount insufficient to poison polymerization, and maintaining the dispersion at 0° to 100° C in presence of an oxygen-yielding polymerization cat until the latex is formed.

U.S.P. 2,605,244 (16.6.51; 29.7.52). J. D. Matlack and R. J. Reid, assrs to Firestone Tire and Rubber Co. A heat stable, melt-extrudable composition comprising, in parts by wt, a crystalline vinylidine chloride polymer, or copolymer with $\gtrapprox$15% other monomer, 100, diphenyl ether 5 to 10, glycidyl phenyl ether 1 to 3, barium ricinoleate 1 to 3.

U.S.P. 2,605,245 (30.6.49; 29.7.52). J. G. Ford, assr to Westinghouse Electric Corpn. Joint packing composition, which swells in contact with oil and thereby

seals the joint, consisting of 30 wt % of a rubbery butadiene styrene copolymer as 100 mesh particles, a resin insol in oil, but sol in an aliphatic monohydric alcohol and 20 wt % of said alcohol.

U.S.P. 2,605,246 (6.4.51; 29.7.52). A. Cresswell and P. W. Cummings, assrs to American Cyanamid Co. Solutions of polyacrylonitrile are prepared by dispersing the polymer in an aq solution containing a water-sol salt which yields highly hydrated ions.

U.S.P. 2,605,247 (17.6.50; 29.7.52). E. C. Schule, assr to Firestone Tire and Rubber Co. Preparation of artificial leather from (*a*) a butadiene copolymer with 30 to 45% acrylonitrile, 10 to 15 wt %, (*b*) calcined clay 10 to 25 wt %, (*c*) vinyl chloride resin 60 to 80 wt %, by milling (*a*) and (*b*) together at $<130°$ F, adding (*c*) and milling at 290° to 340° F, and finally calendering into sheet form.

U.S.P. 2,605,248 (7.7.50; 29.7.52). C. F. Fisk, assr to United States Rubber Co. Heat curable mixtures of butadiene–acrylonitrile copolymers and phenol–aldehyde resins.

U.S.P. 2,605,249 (30.12.49; 29.7.52). H. E. Albert, assr to Firestone Tire and Rubber Co. Rubber-like copolymer of butadiene and styrene stabilized to oxidn with thiodiarylamine and a phenol sulphide containing >4 phenol groups.

U.S.P. 2,605,250 (18.1.49; 29.7.52). B. A. Hunter, assr to United States Rubber Co. A mono-oxalic acid salt of *NN'*-di-*sec*-butyl-*p*-phenylene diamine is used as an anti-cracking chemical in natural and synthetic rubber compositions.

U.S.P. 2,605,254 (22.5.51; 29.7.52). R. J. Wolf, assr to B. F. Goodrich Co. Tough, strong, and easily processed interpolymers containing free side chain carboxyl groups are obtained by polymerizing a mixture containing 35 to 90 wt % vinyl chloride, 5 to 65 wt % of an alkyl ester of acrylic acid, and 0·2 to 25 wt % of an ester of the formula $CH_2{=}CH{\cdot}X{\cdot}RCOOH$, wherein X is an ester linkage and R is a divalent saturated aliphatic radical.

U.S.P. 2,605,251 (9.3.46; 29.7.52). L. J. Kitchen and G. E. P. Smith, assrs to Firestone Tire and Rubber Co. Rubber-like copolymer of butadiene and acrylonitrile stabilized with 2 : 4-dimethyl-6-octyl phenol.

U.S.P. 2,605,252 (1.7.48; 29.7.52). L. J. Kitchen, assr to Firestone Tire and Rubber Co. A vulcanized rubber composition is stabilized without increasing its susceptibility to discoloration by light, with the reaction product of a C_{3-8} alkyl halide and a C_{3-8} olefin alkylated cresylic acid.

U.S.P. 2,605,257 (20.5.50; 29.7.52). R. J. Wolf and A. A. Nicolay, assrs to B. F. Goodrich Co. A mixture of 40 to 85 wt % vinyl chloride, 10 to 50 wt % C_{8-10} alkyl acrylate, and 5 to 35 wt % styrene.

U.S.P. 2,605,258 (12.5.51; 29.7.52). R. S. Rothrock, assr to E. I. du Pont de Nemours and Co. Copolymer of allyloxyethanol (2 to 90 wt %) with a monomer of formula $CH_2{=}CHCN$ or $CH_2{=}CCH_3CN$.

U.S.P. 2,605,259 (3.3.50; 29.7.52). L. M. Germain, assr to Shawinigan Chemicals Ltd. Alcoholysis of a polyvinyl ester of an unsubstituted saturated aliphatic monocarboxylic acid in the presence of excess methanol, an alkaline alcoholysis cat, and sufficient of a pet dist boiling $<200°$ C to produce a 2-phase system, the pet dist initially forming the dispersed phase and inverting to the continuous phase as the reaction proceeds, all the polyvinyl ester initially being in soln in the methanol.

U.S.P. 2,605,256 (2.6.49; 29.7.52). W. R. Conard and C. E. Best, assrs to Firestone Tire and Rubber Co. A C_{1-4} alkyl vinyl sulphide (1 mol) is copolymerized with acrylo-, methacrylo-, or ethacrylo-nitrile (1 to 5 mol) in the presence of 0·2 to 5·0% of a C_{1-12} alkyl or *cyclo*alkyl mercaptan or an aryl, furyl, or furfuryl mercaptan.

U.S.P. 2,605,281 (France 7.4.48; 29.7.52). V. Blinoff, assr to S. A. d'Innovations Chimiques, so-called "Sinnova" or "Sadic." Cation active products of formula

$$RC_6H_4SO_3NC_6H_5$$
$$|$$
$$R_1R_2R_3$$

wherein R = C_{8-18} alkyl; R_1 = C_{1-8} alkyl; R_2, R_3 = methyl, ethyl, or benzyl.

U.S.P. 2,605,294 (2.6.49; 29.7.52). W. S. Barnhart, assr to Firestone Tire and Rubber Co. Preparation of 1 : 4-dibromo-2 : 3-dichloro-2-butene by reacting bromine with 2 : 3-dichlorobutadiene-1 : 3. V. P. P.

U.S.P. 2,629,731 (7.3.51; 24.2.53). D. Harman, assr to Shell Development Co. Esters of phosphonoformic acids and polyhydric alcohols.

U.S.P. 2,629,749 (25.5.49; 24.2.53). L. Schmerling, assr to Universal Oil Products Co. 2-phenyl-3-chloro-or-bromo-bi*cyclo*-(2 : 2 : 1)-heptane. J. M. S.

Ger.P. 862,882, 27.11.52. O. Kruber and R. Oberkobusch, assrs to Ges. f. Teerverwertung. Process for obtaining 1 : 2-dimethylnaphthalene.
BrennstChemie, 1952, **33** (23–4).

Ger.P. 865,302, 18.12.52. O. Frühwirth, assr to Donau-Chemie A.G. Process for obtaining 1 : 1 : 2-trichloroethane.

Ger.P. 867,848, 8.1.53. H. Müller and E. Schäffer, assrs to R. Decker & Helmuth Holz. Method for producing tetrachloroethane.

Ger.P. 867,849, 8.1.53. G. Wietzel, K. Eder, and A. Scheuermann, assrs to Bad. Anilin- & Soda-Fabr. Method for producing aliphatic compounds containing oxygen.

Ger.P. 864,992, 11.12.52. O. Grosskinsky, W. Thürauf, G. Huck, and A. Benning, assrs to Kohlentechnik G.m.b.H. Method for producing cyclic polycarboxylic acids or their mixtures.
BrennstChemie, 1953, **34** (1–2).

Ger.P. 865,294, 15.1.53. E. Feder, assr to Chloberag Chlor-Betrieb Rheinfelden A.G. Process and plant for direct production of perchloroethylene.

Ger.P. 868,295, 15.1.53. H. J. Pistor, assr to Bad. Anilin- & Soda-Fabr. Process for obtaining pure methanol.

Ger.P. 869,059, 22.1.53. Bad. Anilin- & Soda-Fabr. Method for producing olefins.
BrennstChemie, 1953, **34** (3–4). R. T.

Coal, Shale, and Peat

1455. Alkaline permanganate oxidation of oil-shale kerogen. W. E. Robinson, N. H. Heady, and A. B. Hubbard. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 788–9.—Reports studies on oxidn of Colorado and other shales (including British shales), using alkaline potassium permanganate. E. J. C.

1456. Effect of solvent properties in thermal decomposition of oil shale kerogen. W. D. Schnackenberg and C. H. Prein. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 313–22.—To gain information on the chemical constitution of kerogen and the mechanism of its decomposition to shale oil, under conditions of minimum cracking of the resulting fragments, finely ground shale was subjected to thermal soln at 200° C and autogenous pressure, in the presence of selected associating and non-associating solvents. Total yield of product oils was found to be a function of the mol vol of the solvent. Their carbon : hydrogen ratio and the % of original organic N_2 and S solubilized were found to be functions of the internal pressure of the solvent and its associating characteristics. The carbon : hydrogen ratio of the product oils was lower in almost all cases than that of Fischer assay shale oil. N_2 and S contents were considerably less than that of pure kerogen or of an average assay oil. It is postulated that 2 forms of kerogen exist. (Authors' Abstract.) E. J. C.

1457. Production of gas and carbonized fuels—today and tomorrow. H. D. Greenwood. *J. Inst. Fuel*, March 1953, **25** (148), 379.—The different objectives of the gas and coking industries are compared. Subjects particularly discussed include comparsion of economics of carbonization between the gas and coking industries, coal required for future production of gas and coke, coal supplies and the national fuel policy. Possible advantages of centralized carbonization plants and of complete gasification are considered. Various new methods of carbonization and gasification are examined, and the possibility of applying them to the production of reactive smokeless fuel at a reasonable price is discussed. D. K.

1458. General hints on increasing the efficiency in coke oven operation. F. Trefny. *BrennstChemie*, 1953, **34** (3–4), 45–51.—Economical operation of coke ovens is treated fully in relation to : (1) higher coal throughput ; (2) higher yield (including by-products) ; (3) higher quality ; (4) lower production costs. 4 supporting flow-diagrams. 70 literature refs. R. T.

1459. Patents. U.S.P. 2,627,455 (5.6.47 ; 3.2.53). C. H. O. Berg, assr to Union Oil Co. of California. Apparatus for the gasification of coal with oxygen and steam. J. M. S.

Ger.P. 864,247, 14.12.52. W. TerNedden, assr to Gelsenkirchener Bergwerks-A.G. Production of coal–oil mixtures stable in storage from unstable coals.

Ger.P. 861,687, 13.11.52. O. Emele. Process and plant for desiccating peat or other moist material.
BrennstChemie, 1952, **33** (23–4). R. T.

Miscellaneous Products

1460. Co-operative research: exposure testing on a co-operative basis. A. Pass. *J. Oil Chem. Ass.*, Apr. 1953, **36** (394), 151.—The problems encountered in conducting a series of paint exposure tests on a co-operative basis, and their solutions, are discussed. D. K.

1461. Dispersion problems in modern media. W. Carr. *J. Oil Col. Chem. Ass.*, May 1953, **36** (395), 246.—The physical processes for incorporating pigments into various liq systems are discussed. Particularly noted is the pigmentation of the following : dry distempers, oil bound distempers, polyvinyl acetate emulsion paints, other paints, lacquers, printing inks, and plasticizers. The physical properties of the pigments influence the process of incorporation. The pigment may affect the film forming properties of the medium, *e.g.*, with emulsion paints, and it plays an important part in the storage and rheological properties of other systems. D. K.

1462. Comparative exposure tests on typical exterior paint formulations containing white zinc pigments. R. W. Bailey and A. Pass. *J. Oil Col. Chem. Ass.*, Apr. 1953, **36** (394), 171.—A series of exposure tests on exterior paints pigmented with zinc oxide and lithopone was made at 6 sites, representative of the full range of climatic conditions likely to be found in the U.K. Behaviour of different groups of paints and the variations between the sites shown by the tests are set out in graphical form. 30 pigmentations were tested, including 3 types of zinc oxide and lithopone, in two different media. Results were assessed visually and by an arithmetical method of calculating protective and decorative values from periodic examinations of gloss, chalking, checking, cracking, flaking, dirt shedding, discoloration, and erosion.

In the media tested, the zinc pigment formulations all gave paints with satisfactory performance, a mixture of 60% zinc oxide and 40% rutile titanium dioxide being far superior to the other pigmentations.

The relationships between sunshine hours, rainfall, and temp differences on one hand and site severity on the other are expressed graphically, and some tentative conclusions are drawn. D. K.

1463. Emulsion paints. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 710–54.—Symposium comprising 10 different papers on various aspects of emulsion paints. E. J. C.

1464. Touch-up aerosol enamels. F. S. Palmer and R. W. Morrow. *Soap, N.Y.*, Dec. 1952, **28** (12), 191.—The formulation of aerosol enamels is discussed. Data on compatibility of drying oil alkyd resin soln with Freon propellents are presented. Freon 11 is most compatible and Freon 12 least. Short oil alkyds are less soluble than long oil. The composition of the resin solvent also affects the compatibility.

Thinning the enamel to a viscosity low enough for spraying is accomplished, partly by use of conventional solvents, and partly by the propellent. Curves are presented showing effects of various diluents on consistency of both clear resin solutions and pigmented enamels. The interrelationships of consistency, pressure, and spraying

characteristics are presented graphically. The problems of sagging, bubbling, cratering, orange peel, gloss, and valve performance are discussed briefly. M. V. J.

1465. Vinyl emulsion coatings in theory and practice. O. H. Ulrich. *Paint Tech.*, Nov. 1952, **17** (203), 467.—The 4 principal methods of polymerization are discussed: mass polymerization, solvent polymerization, suspension or pearl polymerization, and emulsion polymerization. Polymerization mechanisms are considered.

Polyvinyl acetate emulsion, vinyl copolymers, American butadiene polymers, acrylate and methacrylate polymers, and vinyl acetate and styrene emulsions are particularly noted. There are 20 literature refs. D. K.

1466. Evaluation by *in vitro* and *in vivo* methods of anti-bacterial properties of antiseptic soaps. W. S. Gump and A. R. Cade. *Soap, N.Y.*, Dec. 1952, **28** (12), 52.—*In vitro* and *in vivo* tests on halogenated phenols incorporated in coconut oil soap (2% germicide in case of *in vivo* tests) showed that only G.11 and substances of similar chemical structure (halogenated ortho-ortho' linked bisphenols) had effective skin degerming properties. The test techniques are described. 7 refs. M. V. J.

1467. Modern furniture polishes. M. A. Lesser. *Soap, N.Y.*, Dec. 1952, **28** (12), 162.—The formulation of furniture polishes is reviewed. Reference is made to silicone and insecticidal polishes. 29 refs are included. M. V. J.

1468. The detection of additives to vegetable waxes: the use of instrumental analyses, Pt II. C. J. Marsel, C. S. Treacy, H. Brenner, and F. De Long. *Soap. N.Y.*, Dec. 1952, **28** (12), 181.—The use of infra-red spectroscopy in the detection of additives in vegetable waxes is discussed and illustrated by reference to detection of hydrofol glycerides and Durez 219 in carnauba wax. Brief mention is made of possibilities of X-ray diffraction analysis. 4 refs. M. V. J.

1469. Evaluation of dish-washing detergents. J. C. Harris. *Soap, N.Y.*, Dec. 1952, **28** (12), 45.—Methods for evaluating dish-washing detergents are analysed to find what degree of accord has been attained. Factors considered in Pt I are soil removal evaluation, surfaces tested, machines used, and ways of applying soil to test surface. M. V. J.

1470. Toxicity of soap and detergents. L. C. Barail. *Soap, N.Y.*, Dec. 1952, **28** (12), 48.—Test methods for internal toxicity and skin irritation are surveyed. An animal intradermal single injection method is described, which is said to give excellent correlation with the U.S. Public Health Service Patch Test and to be, in addition, quick, simple, and relatively inexpensive.

The National Safety Council's classification of detergents and sanitizers according to their action on the skin is quoted.

The skin irritating effects of the following groups are briefly discussed: (1) industrial soaps and anionic detergents; (2) industrial cationic and non-ionic detergents; (3) household soaps, detergents, and cleansers; (4) sanitizers and disinfectants. M. V. J.

1471. The construction and application of a light scattering apparatus. W. Rubin and G. T. Tibbs. *J. Oil Col. Chem. Ass.*, Apr. 1953, **36** (394), 195.—The apparatus was originally designed as a Universal reflectometer using a GEC photometer photo cell. Conversion was effected by fitting the light scattering cell in a suitable holder and adding 2 screens to cut down stray reflected light. The theory and practical use of the apparatus are described. The apparatus has been used to identify various grades of polyvinyl acetate and its aldehyde reacted derivatives, to investigate the rate of polymerization of cold cure resins, to study the storage stability of alkyds in the presence of added drier combinations, and to compare the mol. wt. of various oils. Some results obtained are discussed. D. K.

1472. Patents. U.S.P. 2,605,300 (23.2.50; 29.7.52). A. F. Shirland, assr to Union Carbide and Carbon Corpn. Positive electrode for a dry cell which is moulded from a

mixture of natural flake graphite (65 to 325 mesh), pet microcrystalline wax as binder (10 to 50 wt % of mixture), and finely divided talc (< 3 times the wt of graphite). V. P. P.

U.S.P. 2,628,207 (14.9.49; 10.2.53). P. V. Smith, D. W. Young, and R. G. Newberg, assrs to Standard Oil Development Co. Terephthalate esters as plasticizers for vinyl resins.

U.S.P. 2,628,211 (10.12.49; 10.2.53). G. P. Mack and E. Parker, assrs to Advance Solvents and Chemical Corpn. Polyvinyl chloride resins stabilized with polystannoxanediol esters.

U.S.P. 2,628,212 (10.12.49; 10.2.53). D. W. Young, assr to Standard Oil Development Co. Synthetic rubbers are stabilized with 2 : 2-bis(2-hydroxy-3-*tert*-butyl-5-methylphenyl)-propane.

U.S.P. 2,628,952 (27.7.48; 17.2.53). P. A. Sanders and J. R. Vincent, assrs to E. I. du Pont de Nemours and Co. The light stability of butadiene elastomers is improved by adding a nickel salt of a dialkyldithiocarbamic acid.

U.S.P. 2,628,955 (8.6.50; 17.2.53). C. I. Parrish, assr to B. F. Goodrich Co. Rubbery interpolymers of mono*iso*olefins and fulvenes.

U.S.P. 2,629,704–6 (24.5.52; 24.2.53). M. De Groote and B. Keiser, assrs to Petrolite Corpn. These patents relate to synthetic products made by reacting ethylene oxide, propylene oxide, and phenol–aldehyde resins. J. M. S.

Corrosion

1473. Cathodic protection can save chemical process equipment. L. P. Sudrabin. *Chem. Engng*, 1953, **60** (5), 196–200.—The development and improvement of techniques in this field make it possible for a wider application with chemical process equipment. There is a summary of applications, concluding with a list of references. D. M.

1474. How to mitigate corrosion in a glycol-dehydration plant. N. K. Senatokoff. *Oil Gas J.*, 27.4.53, **51** (51), 154.—Changes in operation and use of new equipment are described in the dehydration plants of Southern Counties Gas Co. A reboiler was eliminated, the glycol stream degasified, liquid velocities reduced, filters fitted, and inhibitors and corrosion resistant material used. G. A. C.

1475. Underground corrosion of galvanized steel. Anon. *Oil Gas J.*, 27.4.53, **51** (51), 289.—Tests conducted by the National Bureau of Standards corrosion laboratory on galvanized steel having 3 oz. of zinc/sq. ft., show it to be highly resistant to soil corrosion. G. A. C.

1476. 18-8 stainless steels. Anon. *Chem. Engng*, 1953, **60** (15), 300–12.—The article includes physical and mechanical properties, besides showing the resistance to corrosion of these steels with numerous chemicals, on charts. D. M.

1477. Mitigation of pipe line corrosion. A. C. Farrar. *Oil Gas J.*, 20.4.53, **51** (50), 148.—Information on a cable-system design for rectifiers and on cathodic protection in high-resistivity soil is reported from papers given at a recent meeting of National Association of Corrosion Engineers at Chicago. 4 selected abstracts on pipeline matters are also given. G. A. C.

1478. Preservation of oil tanker hulls. J. Lamb and E. V. Mathias. *Mot. Ship*, Apr. 1953, **34** (397), 12.—This paper is an extract from that read at a meeting of the North East Coast Institution of Engineers and Shipbuilders, and deals with the prevention of corrosion in tankers as exemplified by experience of the Anglo-Saxon Petroleum Co. The first pt discusses the efficiency and economics of various types of mill-scale removal from the exterior of the hull. Flame-cleaning after assembly was found to be the most satisfactory. Pt 2 covers the control of corrosion in the interior of cargo tanks, which are especially vulnerable in the case of tanks carrying white products. Various types of surface coating, including sprayed aluminium and zinc, cementiferous coatings, organic finishes, and plastic coatings, were tested and the costs assessed; none

was found to be an economic proposition. Corrosion inhibition by ventilation and by chemicals are touched on briefly, and, finally, the advantages of cathodic protection are set forth. U. M.

1479. Patents. U.S.P. 2,627,474 (8.11.49; 3.2.53). J. W. Romberg, assr to Texas Co. A quick drying composition for application to metal surfaces to prevent rusting comprises metallic soaps of oxidized paraffin wax, a petroleum cyl stock, naphtha, and a minute proportion of liq dimethyl silicone.

U.S.P. 2,629,649 (31.10.49; 24.2.53). A. Wachter and N. Stillman, assrs to Shell Development Co. Vapour-phase corrosion inhibition by means of non-aromatic amine salts of carboxylic acids.

U.S.P. 2,629,676 (2.9.49; 24.2.53). C. F. Prutton, assr to Lubrizol Corpn. Corrosion inhibitor for metal surfaces, comprising an oil and an oil-sol organometallic phosphide. J. M. S.

Engines and Automotive Equipment

1480. Fuel economy. C. R. Webb and J. G. Lavender. *Auto. Engr*, Apr. 1953, **43** (565), 142.—Optimum values of ignition advance, mixture strength, and compression ratio necessary to achieve lowest specific fuel consumption over the entire range of speed and throttle openings for a petrol engine are discussed. Max power requirements also are considered. Tests were carried out on a Ricardo E.6/R variable-compression engine using 85 octane fuel, and consumption loops with a C.R. of 5·5 and fixed ignition and carburettor settings are compared with results obtained with a C.R. of 7·8 and optimum ignition advance and mixture strength. The author concludes that improved thermal efficiency of high-speed multi-cyl engines at low throttle openings can be achieved by careful design of automatic ignition control devices, together with carburettors capable of supplying a constant mixture strength over the entire working range. 1 ref. T. T.

1481. Sima SPE-6A injection pump. Anon. *Auto. Engr*, Apr. 1953, **43** (565), 158.—A detailed description is given of an injection pump for 6-cyl, high-speed, direct injection engines of about 1·25 litres/cyl. A pneumatic governor with damping regulation for low speeds, a simplified spill control profile, and a special cam profile are incorporated. Optional extras are a solenoid operated cut-off and a fuel pressure actuated enrichment device for starting. T. T.

1482. Gas turbine work in the past year. Anon. *Gas Oil Pwr*, 1953, **48**, 45–8, 58–9, 68.—A résumé is given of some units of over 10,000 kW output now being developed for running on oil fuel.

Descriptions are given of 2 units designed to burn coal or peat. In one case, the peat, containing *ca* 90% water, is first compressed to remove about $\frac{2}{3}$ of the moisture, and is then finally dried in the hot exhaust gases of the turbine. Experiments with tar residues and sawdust are in progress.

In the marine field, the BTH unit in the *Auris* has now been in service for a year, and is burning a residual oil of 1500 sec (Red I). The Rolls Royce 6000-s.h.p. unit employs 3-stage compression and includes a heat exchanger. The operating cycle consists of a LP axial-flow compressor delivering air through a seawater-cooled intercooler to a 2-stage centrifugal compressor. The air then passes through a heat exchanger before passing to the 2 combustion chambers, and thence to 3 mechanically independent turbines, of which the intermediate one is the power turbine. In France, some marine installations comprise 2 free-piston gas generators which supply gas to a geared turbine.

Mention is made of several English and foreign gas turbines for use in automotive engines.

The metallurgy and construction of turbine blades is discussed in more detail. In heat exchangers, Al-bronze tubes have been unsuccessfuly tried, and the tendency now is to use large tubes of low thermal efficiency rather than small tubes of high thermal efficiency, as the air pressure losses are then less. H. C. E.

1483. The latest Ruston gas turbine. Anon. *Mot. Ship*, Apr. 1953, **34** (397), 16.—Illustrations are given of the latest design of the 750-kW unit, of which 18 sets are in hand. With a heat exchanger, thermal efficiency is 22·6% and consumption is 0·61, lb/b.h.p/hr with the turbine developing 1050 b.h.p. and the alternator 750 kW. With no heat exchanger, the output is about 900 kW (1260 b.h.p.), but consumption is higher and thermal efficiency lower. The adaptation of this turbine to marine propulsion is under consideration. U. M.

1484. Ruston and Hornsby peat-burning turbine. Anon. *Gas Oil Pwr*, 1953, **48**, 64–8.—The peat is first dried from 90 to 40% water content by admixture with dry material followed by pressing, and the fuel is then completely dried by exhaust gases and pulverized. In order to transport and meter the peat accurately, it is necessary to percolate air through, so that the particles are maintained in suspension in the moving air stream. The peat is fed to the combustion chamber by rotary pump which comprises a carrier plate containing pockets, which transport the fuel from atmospheric pressure to a point where it can be blown to the delivery line by compressed air.

The peat is burned in a special combustion chamber which, on starting, is heated by a pilot oil burner. Primary air blows the peat into the chamber and ignites it at about 800° C; secondary air is required to burn the volatile matter, and this is introduced at 400° C between the fuel nozzles. Tertiary air is supplied close to the chamber walls; this reduces the wall temp and also supplies further combustion air. At the chamber temp particles of size 75μ burn in *ca* 90 millisec, which represents 4½ ft at a gas velocity of 50 ft/sec, and combustion efficiency is then 95%.

As set up at present, the plant produces air at 4 atm pressure which is used partly as described above, but mostly as dilution air at 180° C. The hot gases are then screened to remove ash (*ca* 2% on peat) and pass successively the H.P. (compressor) turbine and the L.P (power) turbine. H. C. E.

1485. English electric gas turbine. Anon. *Gas Oil Pwr*, 1953, **48**, 72–6.—This 6500-s.h.p. marine gas turbine is designed for a parallel flow cycle in that approx ⅓ of the compressor output is used to drive the power turbine and the remainder is used for the charging turbine. The 15-stage axial compressor supplies 128 lb of air/sec at 58 p.s.i., and is driven at 4000 r.p.m. by the charging turbine of output 13,700 h.p. The power turbine is rated at 6600 h.p. at 5600 r.p.m. Both turbines are identical geometrically, except that the charging turbine has 8 inlet ports and the power turbine 4; both are 5-stage axial-flow machines.

The plant has 4 combustion chambers for the charging set and 2 for the power turbine; all are of the Shell type, consisting of a pack of conical rings arranged to give the effect of alternate flat and radially corrugated plates. This arrangement keeps the flame tubes at a moderate temp, thus preventing oxidn and distortion. The fuel system is also of the Shell type with one pilot and 3 main burners per combustion chamber.

An electric motor drives the set to 300 r.p.m., when the burners are lit, and is cut out at 2000 r.p.m.; the time required is *ca* 5 min, and full power is available 15 min later. Control is effected by a single lever, the effect of which is, in raising speed, to increase gradually the fuel supply to all combustion chambers until the required speed is attained. In lowering speed, the fuel supply is reduced and the power turbine throttle valve is partially closed, and a blow-off valve is partially opened. Closing the throttle valve in turn initiates a movement which gradually reduces the rate of fuel supply to the charging set. This latter movement can be cut out if required, and if this is done, changes of power and speed may be made within a few seconds.
H. C. E.

1486. Stork-Thomassen two-stroke engine. P. C. Brunting and G. Wieberdink. *Gas Oil Pwr*, 1953, **48**, 55–7.—These vertical units have outputs from 400 to 1450 b.h.p. at a max speed of 600 r.p.m. The cyl dimensions are 240 mm bore and 360 mm stroke. Scavenging air supplied by centrifugal blower enters the cyl through ports during the lower part of the stroke, and the exhaust gases are expelled through a central overhead valve in the cyl head.

The pistons are cooled by oil supplied via the main bearings through the hollow connecting rods. The combustion chambers are of smaller dia than the cyl, and the swirl effect in the chamber is thereby increased as the piston approaches t.d.c. The injector is offset and the combustion is not cooled. H. C. E.

1487. New two-stroke marine engines. W. Kilchenmann. *Mot. Ship*, May 1953, **34** (398), 70.—Extracts are given from a paper given to the Institute of Marine Engineers, describing the latest Sulzer engines, the RS type, for geared high-powered machinery; they will supplement and not replace the existing range. RS76, the larger of the engines, is intended for direct drive, and has a bore of 760 mm, stroke of 1550 mm, and delivers 900 to 1000 b.h.p/cyl at shaft speeds of 110 to 115 r.p.m. The smaller of the engines, RS58, has been designed chiefly for geared installations. It has a bore of 580 mm, stroke of 760 mm, and cyl output of 520 b.h.p. at 240 r.p.m. Both engines can be built in units of 4 to 12 cyl, and are designed to run on boiler oil. U. M.

1488. Patents. U.S.P. 2,602,289 (17.5.46; 8.7.52). R. Anxionnaz and M. H. L. Sédille, said Sedille, assr to Société Rateau (S.A.). Method and means for propelling a vehicle with a reaction jet engine using normally gaseous fuel in both gaseous and liq form.

U.S.P. 2,602,290 (7.5.47; 8.7.52). R. H. Goddard, by E. C. Goddard, assr of one-half to the Daniel and Florence Guggenheim Foundation. Rotational fuel feed for combustion chambers.

U.S.P. 2,602,293 (7.2.48; 8.7.52). R. H. Goddard, by E. C. Goddard, assr of one-half to the Daniel and Florence Guggenheim Foundation. Combustion chamber *A* for rockets, having igniters of the hot flame type in which a port is provided in *A* to admit an ignition flame, valve mechanism ensuring that the port is opened only for ignition operation.

U.S.P. 2,602,291 (16.12.47; 8.7.52). G. Farnell, assr to Ingersoll-Rand Co. Resonant explosion power unit for generating gases to operate a turbine in which cooling air is introduced into the explosion chamber between successive explosions and explosion gases are discharged from the chamber at constant pressure.

U.S.P. 2,602,292 (31.3.51; 8.7.52). B. O. Buckland and A. J. Nerad, assrs to General Electric Co. Fuel–air mixing device for gas turbine power plant, using a rotary centrifugal type air impeller as atomizer for the liq fuel, the fuel being introduced into the air steam leaving the impeller, so that a fuel and air spray cone is formed. The fuel and air mixing circulation in the primary zone of the combustion chamber may be aided by the air impeller taking a portion of its suction from the hot gases at the centre of the chamber.

U.S.P. 2,603,063 (19.5.50; 15.7.52). J. L. Ray, assr to Allis-Chalmers Manufacturing Co. Control of continuous gas turbine systems, embodying a separate compressor driving turbine *A* and excess power developing turbine *B*, in which the power output of *A* is varied as the quantity of fluid entering *B* changes in order to compress and deliver to the combustion chamber a quantity of air commensurate with the power requirements of both turbines.

U.S.P. 2,603,062 (30.9.49; 15.7.52). R. E. Weiler and J. S. Hardigg, assrs to Westinghouse Electric Corpn. Variable area jet nozzle, including a pair of nested frustoconical wall members having longitudinally disposed flexible leaves arranged in staggered overlapping relation and cable means encompassing the outer leaves for applying the desired adjusting force.

U.S.P. 2,603,064 (12.12.46; 15.7.52). S. B. Williams, assr to Chrysler Corpn. Combustion chamber with multiple conical sections providing multiple air paths for gas turbines.

U.S.P. 2,604,755 (Sweden 23.12.48; 29.7.52). V. F. A. Nordström and D. A. Morosoff, assrs to De Laval Steam Turbine Co. Combined gas and steam turbine plant using a burner in the gas turbine exhaust to heat steam.

U.S.P. 2,605,081 (25.4.46; 29.7.52). J. S. Alford, assr to General Electric Co. Combined exhaust hood and radiation cooling cap for gas turbines which can be readily dissembled.

U.S.P. 2,603,453 (11.9.46; 15.7.52). F. P. Sollinger, assr to Curtiss-Wright Corpn. Construction for flowing cooling air to the rim of a turbine wheel, in which a pair of shelf-like spaced flanges project from a turbine blade shank and co-operate with similar flanges on the shanks of the adjacent turbine blades to provide passages between the shanks of each blade communicating with opposite ends of the turbine rotor. Cooling air circulates through these passages to cool the shank of the turbine blades, thereby reducing the heat conducted to the web of the turbine rotor. The radially outer flanges co-operate to form a continuous cylindrical surface forming the radially inner boundary of the turbine working fluid, the working portions of the turbine blades projecting outwardly from this surface.

U.S.P. 2,603,945 (14.6.49; 22.7.52). C. R. Brown, assr to U.S.A. (Secretary of the Navy). Jet engine with afterburner.

U.S.P. 2,603,949 (28.11.47; 22.7.52). E. D. Brown, assr to United Aircraft Corpn. Annular combustion chamber for jet propulsion or gas turbine power plants, in which vanes positioned in the zone where primary air and fuel are mixed and burned cause trailing vortices to form as the fluid flows through the passage.

U.S.P. 2,604,149 (U.K. 25.10.48; 22.7.52). C. H. L. Wynne, assr to D. Napier and Son Ltd. Apparatus for supplying fuel to the combustion chamber of a gas turbine, comprising one or more burners of the spill type, and means for delivering fuel continuously and preferably at constant pressure, metering the fuel supply to the burner(s), and simultaneously metering the spill flow from the burner(s).

U.S.P. 2,604,510 (30.11.49; 22.7.52). D. C. Berkey, assr to General Electric Co. Automatically retractable spark plug for gas turbines.

U.S.P. 2,602,288 (Neth. 5.3.43; 8.7.52). H. Rinia and H. de Brey, assr to Hartford National Bank and Trust Co. Hot gas piston engine with power output control.

U.S.P. 2,604,367–8 (20.9.50; 22.7.52). S. H. Norton, assr to Thompson Products Inc. (*a*) Sheet metal oil control piston rings, having axially spaced apart scraping edges defined by upper and lower layers of circumferentially spaced crown segments joined through alternate oppositely inclined cross-over webs. (*b*) Piston rings having upper and lower annular layers of T-shaped ring segments with head edges providing cyl-engaging surfaces and with legs having integral connection with cross-over webs extending between the layers and equipped with projections forming struts to make the segments rigid.

U.S.P. 2,602,715 (17.2.50; 8.7.52). J. F. Shirk, assr to Perfect Circle Corpn. Piston ring made of sheet metal, comprising a pair of segmental rails in which opposite segments have a relatively stiff connexion with each other, and are held in alignment without being affected by the circumferential expansion and contraction of the ring. Provision is made for flow of oil inwardly through the ring.

U.S.P. 2,602,703 (Sweden 22.9.48; 8.7.52). H. G. Camner, assr to Akt. Atlas Diesel. A fuel injection valve of small dia, in which the portion directly exposed to the combustion heat can be exchanged.

U.S.P. 2,603,466 (27.10.48; 15.7.52). D. E. Anderson, assr to Thompson Products Inc. A supplementary fuel feeding device *A* is mounted on a separate mounting flange *B* removably secured to the carburettor between the venturi block and the throttle, *B* having a central aperture for the flow of fuel and air therethrough which is contoured to define the outlet mouth of the carburettor venturi. *A* is thus installed directly on the carburettor and discharges fuel into the main fuel–air mixture as it issues from the venturi.

U.S.P. 2,604,086 (25.3.47; 22.7.52). F. J. Villforth, assr to Texas Co. Injection nozzle for I.C. engine, supplying at least 2 jets in slightly different angular relationship, but in the same general direction on one side of the combustion space. These jets include a smaller non-flaring pilot jet directed close to the locus of spark ignition, and at least 1 larger flaring main jet alongside the pilot jet for uniform impregnation of the swirling air moving past the locus of injection.

U.S.P. 2,605,141 (29.10.46; 29.7.52). T. T. Pyk and H. G. Camner, assrs to Akt. Atlas Diesel. Cam-driven fuel injection apparatus for I.C. engines, comprising a pump producing a moderate rise of the fuel pressure combined with an injection valve

opening at this pressure and staying open during the initial stage of the injection period, the pump then further raising the fuel pressure to a high value. Between injection periods, a fuel pressure at the injection valve is maintained, which is greater that the max pressure in the cyl, thus preventing passage of combustion gases past the valve.

U.S.P. 2,603,159 (23 10.47; 15.7.52). L. E. Johnson, assr to Caterpillar Tractor Co. Fuel injection system for an engine, having a fuel manifold *A* disposed above and connected to a plurality of injection pumps, and a vent disposed above *A* connected to the sources of fuel and to *A* for automatically and continuously venting air from the fuel supplied to the pumps.

U.S.P. 2,601,868 (8.3.44; 1.7.52). G. H. Gill, assr to The Garett Corpn, Airesearch Manufacturing Co. Method of lubricating I.C. engines in cold weather in which a small portion of the lub oil is heated by and circulated through the engine. The warm oil is flowed through a valve into a restricted area of a reservoir of the cold oil, which is thereby warmed. When all the oil is heated, the valve causes all the oil to flow through the reservoir and bypass the restricted area.

U.S.P. 2,602,648 (18.5.49; 8.7.52). C. S. Martel, assr to Standard-Thomson Corpn. Liq to liq heat exchanger for operation at high pressures, particularly useful for transfer of heat between lub oil and fuel in turbo-jet aircraft. It comprises a casing having a series of connected small cells, each constituting a single path for the oil, whereby the use of longitudinal baffles is avoided. Each cell is provided with a core of a relatively small bundle of tubes arranged longitudinally to provide for passage of the fuel.

U.S.P. 2,602,461 (U.K. 10.12.43; 8.7.52). D. N. Walker, assr to Power Jets (Research & Development) Ltd. Lubrication system in which an amount of diluent is injected into the oil dependent upon the viscosity and temp of the lubricant.

U.S.P. 2,602,547 (19.9.47; 8.7.52). C. W. Floss and J. K. Gilbert, assrs to Ford Motor Co. Full flow oil filter, in which a bypass valve, comprising a dumb bell shaped element arranged for axial movement, connects the oil inlet and outlet. The element is exposed on one side to the oil pressure in the outlet and on the other to the opposing pressure of a spring, and has a central restricted portion in register with a passageway connecting the inlet and outlet, whereby oil flows from inlet to outlet until a predetermined pressure has been established in the outlet.

U.S.P. 2,605,046 (U.K. 17.1.47; 29.7.52). C. C. S. Le Clair, assr to Tecalemit Ltd. Centrifugal clarifier particularly adapted for cleaning lub oil in an I.C. engine, comprising a centrifuge bowl divided into a plurality of concentric annular spaces through which the liquid is caused to flow, the separated matter being retained in the spaces.

U.S.P. 2,604,087 (22.9.48; 22.7.52). D. W. Gregory and E. R. Baldassare, assrs to Simmonds Accessories Inc. Manufacture of spark plugs by mounting a metal sealing cone in the lower part of the insulator, the cone being electrically connected to the sparking tip, providing a body of molten metal of m.p. approx that of silver around the cone and to a considerable depth in the insulator, and inserting a second sealing cone pointed downwardly in the insulator above the molten metal, and applying pressure to the second cone to drive it into the cone and to the molten metal, whereby it is driven suddenly into intimate contact with the hot inside wall of the insulator and bonded thereto. V. P. P.

U.S.P. 2,627,254 (12.6.47; 3.2.53). K. J. De Juharz, assr to Texas Co. Fuel injection nozzle.

U.S.P. 2,627,259 (24.6.42; 3.2.53). J. G. Wood and A. V. Jackson, assrs to General Motors Corpn. An I.C. engine poppet valve, consisting of a thin shell of copper coated with chromium.

U.S.P. 2,627,906 (U.K. 23.2.48; 10.2.53). C. L. Johnson, assr to Rolls-Royce Ltd. Fuel metering system for I.C. engines.

U.S.P. 2,627,907 (7.10.48; 10.2.53). A. S. King, assr to U.S.A. (Secretary of the Navy). Gas turbine fuel feed system with vapour removing means.

U.S.P. 2,628,112 (14.11.49; 10.2.53). G. G. Hebard, assr to Phillips Petroleum Co. Self-aligned lubricating stuffing box.

U.S.P. 2,628,475 (26.6.46; 17.2.53). D. P. Heath, assr to Socony-Vacuum Oil Co. Jet combustion burner, embodying pretreatment of fuel before combustion.

U.S.P. 2,628,600 (22.12.48; 17.2.53). J. B. Malin, assr to Texas Co. Control of glow-wire ignition means in I.C. engines. The current flowing to the glow-wire is increased and decreased as the amount of fuel supplied per cycle is decreased and increased.

U.S.P. 2,628,721 (23.11.49; 17.2.53). V. P. Matthews, assr to General Motors Corpn. Gasoline filter. J. M. S.

Safety Precautions

1489. Fire prevention and control. Anon. *Petrol. Times*, 17.4.53, **57** (1453), 422.—This is the title of the findings of the Technical Assistance Mission No. 67 of the O.E.E.C. published by H.M.S.O. It reviews scientific methods of fire prevention and control applied by the U.K., France, Netherlands, Germany, Switzerland, and Italy. G. A. C.

1490. Industrial fires and explosions from electrostatic origin. R. Beach. *Mech. Engng, N.Y.*, Apr. 1953, **75** (4), 307.—Basic characteristics of flammable products and their susceptibility to generating static electricity are described, causes of electrostatic hazards are discussed, control techniques for the mitigation of these hazards are indicated, and illustrations of the principles as applied to practice are cited. By installing correctly applied antistatic controls, electrostatic fire and explosion hazards can be virtually eliminated, and many industrial processes accelerated. 14 refs. T. T.

1491. Safety is your business. J. Guelich. *Chem. Engng*, 1953, **60** (5), 211–13.—Points to watch when entering tanks or opening lines, also means of preventing dermatitis and slow poisoning. D. M.

Miscellaneous

1492. Economic survey of Europe since the war. Anon. *Petrol. Times*, 1.5.53, **57** (1454), 451.—An outline of points on petroleum is given in this, the 6th of a series of reports by the Economic Commission for Europe. It gives the post-war setting, and includes an analysis of economic developments in the Soviet Union. G. A. C.

1493. U.K. petroleum trade in 1952. G. Sell. *Inst. Petrol. Rev.*, 1953, **7** (75), 81.—The salient facts of this paper are:

1. Imports of crude petroleum into the U.K. in 1952 were nearly 6000 million gal, representing an increase of 38·6% over 1951. These imports have doubled in 4 years.
2. The total import of refined products into the U.K. in 1952 dropped by 39·3% compared with 1951.
3. The total import of crude plus products at 7597 million gal was 8·8% higher than in 1951.
4. Motor spirit imports dropped to less than 50%.
5. Other liq fuel imports dropped by amounts ranging from 21·7% for kerosine to 46·5% for gas oil.
6. Solid and semi-solid product imports were also less.
7. The chief crude supplied in 1952 was Kuwait.
8. Re-exports in 1952 were appreciably less than in 1951.
9. Exports of oils manufactured in the U.K. were 81·3% higher than in 1951.

R. H.

1494. The petroleum industry and the DSIR. Anon. *Petrol. Times*, 15.5.53, **57** (1455), 495.—Points of interest from the 1951–52 report include preparation of standard hydrocarbons, use of foam on petrol fires, flow proportions of residual oils, research on lubrication, surge characteristics and pumps, use of lower grade fuels, residual fuels for gas turbines, and lubricants for C.I. engines. G. A. C.

1495. Use and abuse of fuels. W. E. P. Johnson. *J. R. Soc. Arts*, March 1953, **101**, 236–58.—The nature, distribution, and application of fuels are discussed and the functional and absolute economy of fuel is described. The heavy capital outlay involved in such work is emphasized. The inefficiencies of engines, power stations, etc, and the expectations of gas turbines are discussed. Inefficiencies through not making the utmost possible use of the remaining available energy from exhaust or condenser heat are examined, and many examples are given of power-operated exothermic processes and drying operations. The advantages of the "pressure-still" cycle and the "inverted cycle" gas turbine are described. W. H. C.

1496. Will the growth of Middle East oil revive international compact talk? R. L. Dudley and R. E. Spann. *Petrol. Refin.*, 1953, **32** (3), 77–84.—A discussion of the future of Middle Eastern oil in relation to the prosperity of other producers. R. D. S.

1497. Petroleum review. Anon. *Petrol. Refin.*, 1953, **32** (3), 97–112.—Consists of 7 short articles headed: "Refinery operations equal max demands"; "Petroleum demand will increase slightly"; "Prices will remain generally stable"; "Stocks are too high in certain categories"; "Oil using units continue rapid growth"; "Bunker 'C' fuel oil is still a by-product"; "World supply and demand increases 4·8%." Illustrated with tables and charts mainly based on U.S. Bureau of Mines reports for the last 20 years. R. D. S.

1498. Do you know these words? B. H. Weil. *Petrol. Process.*, 1953, **8** (4), 553–4.—3 new chemicals are discussed which have special significance as materials derived from pet or natural gas, and have potential volume uses in chemical products. These are hydrazine, pyridine, and urea. Although hydrazine has long been employed as a reducing agent and solvent, the present interest is in its use as a high energy speciality fuel for rockets. Costs of hydrazine are too high to be useful as a commercial fuel at the present time. Pyridine also has found new uses; recently there has been a heavy demand for this by-product of coal and pet, in the field of waterproofing, vitamin synthesis, and the preparation of drugs. Much of the urea required in the future for plastics, adhesives, medicines, and fertilizers, will come from natural gas. During 1952, at least 3 of the new natural-gas ammonia plants in the U.S. planned to produce urea as one end-product to the extent of several hundred thousand tons per year. J. W. H.

1499. Fuels consumed for residential and commercial space heating, 1935–1951. A. T. Coumbe and J. F. Avery. *Inform. Circ., U.S. Bur. Min.*, No. 7657, Jan. 1953, 10 pp.—Statistics are recorded of the consumption of gaseous, liq, and solid fuels and electricity for residential and commercial space heating in the U.S.A. for the years 1935–51. Tables are also given showing: the sales of domestic oil burners and the number in use, the fuel used in manufacture of gas and electricity, the total energy consumption, percentage of total mineral fuels, indicated consumption of mineral oils for all uses in the continental U.S., and percentage of energy used and therms *per capita*. W. H. C.

1500. Petroleum and fuel standardisation. A. Beyer. *Erdöl u. Kohle*, 1953, **6**, 148–50.—(*Cf.* Abs. 1754, 1952). List of German (DIN) standards (including tentative and proposed), covering specifications and test methods for lubricants, liq fuels, L.P.G., pet solvents, which have been issued or initiated during the past year. V. B.

1501. Survey of cycling-plant operations. Anon. *Oil Gas J.*, 27.4.53, **51** (51), 225.—Number and capacity of plants in the U.S. producing LP gases, and those not so producing, are listed. G. A. C.

1502. Radioactive isotopes in applied research and in industry. G. Monnot. *Rev. Inst. franç. Pétrole*, 1953, **8**, 68–76.—Use of isotopes, either as radioactive tracers, previously incorporated in system under investigation, or radiation sources created by subsequent irradiation, is outlined, and some of the more easily available radioactive isotopes are listed. Examples of application are given, including wear studies

in lubrication, oil flow in reservoir rocks, mechanism of Fischer-Tropsch reaction. Other applications include use of radioactivity in level gauges, pipelines, well drilling, etc. 81 refs. V. B.

1503. Use of radioactive isotopes in Canadian oil. L. Walter. *Petrol. Times*, 15.5.53, **57** (1455), 499.—Isotopes for industrial use are listed, and their employment for tank inspection, examination of pipeline welds, well logging, and weld inspection of Hortonspheres is briefly reviewed. G. A. C.

1504. A short cut to gasoline and cycling plant costs. E. W. Kilgren and C. S. Miller. *Oil Gas J.*, 27.4.53, **51** (51), 144.—2 methods are presented for making preliminary cost estimates for natural gasoline and cycling plants. The first requires 5 min, the second 1 hr. G. A. C.

1505. The removal of oxides of sulphur from flue gases. R. L. Rees. *J. Inst. Fuel*, March 1953, **25** (148), 350.—The historical development of flue-gas washing at power stations is traced. The original Battersea process, the modified Battersea process, and the Howden-ICI cyclic lime process are discussed. Discharge of washed and unwashed flue gases from chimneys, and costs and pollution are also considered. The discharge of hot gas (*i.e.*, unwashed) at reasonably high speed from tall chimneys is considered the best answer to the problem of pollution by SO_2 emitted from power stations when normal fuels are burnt. 44 literature refs. D. K.

1506. Utilization of tank bottom sludge. Anon. *Petrol. Times*, 1.5.53, **57** (1454), 469.—Some details are given of that section of the Report on the work of the Department of Government Chemist for Year ended 31 March 1952 (HMSO, 1*s.* 0*d.*), which deals with pollution of sea and foreshore by waste oil. G. A. C.

BOOK REVIEW

Statistical Summary of the Mineral Industry. Production, Imports, and Exports, 1945–51. Mineral Resources Division, Colonial Geological Surveys. London: HMSO, 1953. Pp. 345 + iv.

Over 10 per cent (38 pages) of this annual volume of statistical information relating to the minerals of the world is devoted to petroleum and its products. In this section, details are given of production of crude petroleum, natural gasoline, natural gas, natural asphalt, asphalt rock, and oil shale, and of production, exports, and imports of crude oil and refined products in a large number of countries.

The information covers the seven years 1945–51, and although the information for 1951 was not available in some cases, this is the exception rather than the rule.

This publication should prove of considerable value as a ready source of information, not only on petroleum statistics, but in relation to all minerals. G. S.

ADDITIONS TO THE LIBRARY

British Standards. British Standards Institution.

B.S. 46 Pt I: 1953. Keys and Keyways. Pp. 31. 5*s*. net, post free.

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Oilfield Exploration and Exploitation

Geology

1507. Reclassification of outcropping Tuscaloosa group in Alabama. C. W. Drennen. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (3), 522.—A study of the outcropping Tuscaloosa group in the Upper Cretaceous in Alabama has led the writer to conclude that the group is chiefly of near-shore marine origin, that it is tectonically disturbed in many places, and that the Tuscaloosa group contains only 2 units of formational rank. These consist of a lower unit—the Coker formation, which is redefined to include all beds of pre-Gordo Tuscaloosa age—and an upper unit—the Gordo formation.

E. N. T.

1508. Salt-ridge hypothesis on origin of Texas Gulf Coast type of faulting. M. Quarles, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (3), 489.—This paper presents the results of several years' investigations of the reasons why faulting around the Texas Gulf Coast differs both from the faulting described in geological text-books and that found elsewhere in the world.

The author develops a " salt-ridge " hypothesis, which is claimed to be the only one of the three hypotheses considered that satisfactorily explains all the Gulf Coast fault characteristics that are shown on seismograph sections. The salt-ridge hypothesis states that deep-seated vertical intrusions of salt in the form of long, narrow ridges push up the Gulfward-dipping beds along their strike to form deep-seated anticlines. A pattern of normal faults with dips of approx 45° has therefore to develop on every anticline as an adjustment for the vertical forces involved. Depressions or " edge-synclines " may parallel the ridges on one or both sides as a result of salt removal.

The author considers that neither the alternative " subsiding-basement " nor the " slipping-plane " hypotheses are found to be adequately in agreement with present evidence.

E. N. T.

1509. Wellman field, Terry County, Texas. K. C. Anderson. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (3), 509.—The Wellman field is situated approx 50 miles S.W. of Lubbock, Texas, and is of geologic interest inasmuch as it illustrates what are believed to be 2 types of reefing. A thick oil column of 817 ft adds much economic interest to the field.

The producing horizon is a limestone reef in the lower part of the Wolfcamp Permian series, which was deposited upon a local feature of the extensive Pennsylvanian reef

trend known as the Horseshoe atoll. The author produces evidence to show that the structure found above the Wolfcamp reef is not related to this reef, but directly to the Pennsylvanian reef. The difference in effect of the two reefs is not to be found within the reefs, but in the lack or presence of contemporaneous flank sedimentation. The draping of younger rocks is the result of initial dips over the Pennsylvanian reef.

E. N. T.

1510. Ouachita chert facies, Southeastern Oklahoma. B. H. Harlton. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (4), 778.—In the Ouachita Mountains of S.E. Oklahoma, 2 different facies of rocks which range in age from Ordovician to Lower Mississippian are in close proximity to each other. The problem of how these rocks of the same age could change in facies within such a short distance is an intriguing one.

Previous authors have suggested thrust faulting of great magnitude which has brought into proximity sediments from different geosynclines; the present writer rejects this theory in favour of minor faulting, and the essential identity of both series. E. N. T.

1511. Crater Mound (Meteor Crater), Arizona, a geologic feature. D. Hager. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (4), 821.—This paper summarizes the results of 30 years' observations at Crater Mound, 20 miles W. of Winslow, Arizona. It is concluded that, while there is evidence of a meteor shower occurring in the neighbourhood, this bears no relationship to the origin of the crater, which was present before the shower.

A tectonic–geomorphic origin is postulated. The present mound is the remnant of an elliptical dome with a graben-like sink in its apex, caused by the leaching-out and stoping by solution of an evaporite and limestone section. The folding is probably late Miocene or early Pliocene in age. E. N. T.

1512. Geology of West Edison oilfield, Kern County, California. H. H. Sullwold, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (4), 797.—This field is on the fairly level floor of the San Joaquin Valley, about 9 miles S.E. of Bakersfield in the cluster of fields known as the East Side San Joaquin Valley district. Oil is found in the non-marine Chanac formation (Plio-Miocene), marine Santa Margarita sand (Upper Miocene), marine Nozu sand (Middle Miocene), and Olcese sand (Lower Miocene). The field lies on a S.W.-dipping regional homocline, and oil accumulation is due to faulting and some lensing. The current production is 4200 b.d., or an average of 23 b.d. per well. The field was originally discovered in 1935. E. N. T.

1513. Mississippian cyclic sedimentation, Sunwapta Pass area, Alberta, Canada. A. C. Spreng. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (4), 665.—The area described is about 220 miles S.E. of Wapiti Lake, and 90 miles N. of Banff. 2 sections of the cyclic Banff formation were measured in detail for the purpose of determining whether the nature of the cycles would be of value in making detailed correlations.

Fundamentally, the Banff cycles consist of alternations of limestone and shale, and no consistent trend of succession of these cycle types which could be used for correlation was found in the sections examined.

However, it was discovered that these simple limestone–shale cycles were part of a larger, more complex megacycle which recurs persistently throughout the section. These megacyclic units could be used in correlating the sections at Sunwapta Pass and Mount Coleman. E. N. T.

1514. Geology of Venezuela and its oilfields. E. Mencher *et al.* *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (4), 690.—The first part of the paper consists of an attempt to decipher the general geological history of Venezuela as a setting for the conditions under which the oil-bearing strata originated. The second part deals with the geology of the individual Venezuelan oilfields, in both the eastern and western petroliferous provinces. A correlation chart of geological formations is given. E. N. T.

1515. Introduction to check list of Japanese Tertiary marine mollusca. K. Hatai and S. Nisiyama. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (3), 539.—The check list which this paper introduces is the partial result of a project sponsored by the Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, for

the purpose of aiding exploration for petroleum and coal resources in Japan. The paper announces the preparation of an alphabetically arranged check list of Japanese Tertiary marine mollusca, exclusive of Amphineura.

The mollusca of the Tertiary formations of Japan provide no direct evidence for correlation with the currently accepted sequence of European Tertiary stages. An attempt is made, however, to define the relative position of the chronologic boundaries in the Tertiary sequence. E. N. T.

1516. Ripalta gas field, Po Valley, Northern Italy. V. Fois. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (4), 654.—The Ripalta gas field is located in the N.W. part of the Cremona province, in the north-central part of the Po Valley. Tertiary deposits have been folded in this area, and several of these structures produce commercial quantities of oil and gas.

The Ripalta structure was discovered in 1944 by the use of the reflection seismograph, and the first gas well began producing in 1949. Of the 23 wells drilled at the time of writing, 20 are productive from Lower Pliocene sands at depths of about 5200 ft.

E. N. T.

1517. Geomicrobiology in petroleum industry. A. Luchterowa. *Bull. (Polish) Inst. Petrol.* (Supplement to *Nafta (Krakow)*, 1952, **8**), 1952, **2**, 7–8.—Geomicrobiology is being employed to solve the questions of origin of petroleum, its separation from sedimentary rocks, and petroleum prospecting. The various breeds of bacteria are briefly described: their appearance in known oil-bearing areas points to a new way of prospecting. The metabolism of various kinds of these bacteria enables some to reduce sulphates, some to consume paraffins, others to oxidize aromatics; paraffins with 10 to 16 C atoms are easiest to attack. The presence of gaseous paraffins in subsoil over petroleum reservoirs is affected by them. In the Soviet Union some 18,000 samples, half from known areas, are being correlated with the known subterranean structure.

M. S.

Geophysics and Geochemical Prospecting

1518. Instruments for geophysical exploration. D. H. Clewell *et al.* *Rev. sci. Instrum.*, 1953, **24**, 243–66—Locations of structures in which commercial deposits of petroleum may occur can be accomplished by two main methods: (1) measurement of distortion of the earth's potential fields (gravitational or magnetic); (2) reflection of energy waves from interfaces of adjacent strata (seismology). In addition, information can be obtained by running electric and radioactivity logs of boreholes.

The gravity meter measures g at a series of stations spaced uniformly on the earth's surface, and consists essentially of a mass suspended by a coil spring. Detailed descriptions are given of the theory and design of the instrument, and the method of adjustment for environmental changes, with particular reference to one type of meter.

The field magnetometer measures either component, or the total, of the earth's magnetic field at a series of stations, and is often used in reconnaissance. Two types, the magnetic balance and the saturable core instrument, are described in detail.

The apparatus used in seismic prospecting is described in detail under the headings: geophones (seismometers); amplifiers; master control; mixer; and camera. The geophone converts the earth vibrations into an electrical signal over the frequency range 20 to 100 c.p.s. Desirable features of the amplifiers are discussed, and a typical circuit diagram is given. The camera converts the output voltages of the amplifiers into a mechanical motion and thence to movement of a light beam, followed by the recording of the beam on sensitized paper together with a time scale. As many as 54 traces have been recorded simultaneously.

The most common measurements in well logging are those of electrical resistivity, self-potential, and radioactivity. Instruments must be < 4 in dia, operate over cables up to 20,000 ft long, and withstand temp and pressures up to 300° F and 10,000 p.s.i.

Measurement of electrical resistivity with low frequency A.C. current using 2, 3, or 4 electrodes, and a technique employing induced currents, which is not limited by the necessity of having the boreholes filled with a conducting liq, are described.

Self-potential logging measures the potential between the drilling fluid and the particular formation, and is done by recording with a high impedance detector the e.m.f. between an electrode in the borehole and one at the surface.

γ-ray and neutron logging give information about the nature of the rock formations; in the former the natural radioactivity is measured, and in the latter the γ radiation from rock formations is measured after bombardment by neutrons introduced into the borehole. Apparatus for this work is described, with special reference to design of ionization chambers, electrometers, Geiger counters, and scintillation counters.
H. C. E.

1519. Hydrochemical prospecting for petroleum reservoirs. J. J. Glogoczowski and K. Szypulowa. *Nafta* (*Krakow*), 1952, **8**, 145–7.—At present it is impossible to draw definite conclusions about the meaning of relative values of the ions found in waters in 3 different geological formations, but it seems a promising indication of presence of hydrocarbons at greater depths. The ions considered are HCO_3^-, Cl^-, SO_4^{--}, Ca^{2+}, and Mg^{2+}. 3 tables give numerical results. M. S.

1520. Fourier analysis. F. J. McDonal. *Rev. sci. Instrum.*, 1953, **24**, 272–6.—An analog computer which provides Fourier analyses of transients encountered in seismic research is described. The integral $\int F(t)\sin \omega t dt$ is evaluated by analog computer elements which perform the generation of the functions $F(t)$ and $\sin \omega t$, multiply the two functions, and integrate the product. The function $F(t)$ is generated from a variable area recording on film by a photocell and amplifier mechanism simultaneously with the generation of the sine function $\sin \omega t$ by mechanical means. Multiplication of these two functions is performed by the potentiometer method, and integration is accomplished by servo integrators. The instrument also includes control and calibration equipment which facilitates rapid and accurate analyses. (Author's Abstract.)
H. C. E.

Drilling

1521. Treating drilling muds with carboxymethylcellulose. M. Cubelic. *Nafta* (*Yugoslavia*), March 1953, **4** (3), 93–6.—The paper describes the properties of carboxymethylcellulose and its action on bentonite-type drilling muds. Laboratory experiments as well as field tests with commercial products (Tylose, Kalle and Co., Wiesbaden–Biebrich) gave very satisfactory results. (Author's Summary.)

Production

1522. Conditions of rational exploitation of natural oil flow. R. Kruczek. *Nafta* (*Krakow*), 1952, **8**, 147–52.—From consideration of crude saturated with gas in the reservoirs, the conclusion is drawn that it is advantageous in the long run to limit exploitation, and thus to prevent separation of gas and liq underground. Full and deep sampling is necessary. M. S.

1523. Systematic production control in the field as a basis for rational exploitation of crude. C. Hakiel. *Nafta* (*Krakow*), 1952, **8**, 209–12, 241–3.—Exploitation of reservoirs falls historically into 3 phases: (1) spontaneous and inexperienced blind production responding rapidly to market requirements; (2) the phase is marked by introduction of production measurement and control, and consequently discovery of certain reservoir laws, only 10 to 20% of crude available is yielded; (3) the phase is thoroughly scientific, yielding 30 to 80% of deposits. The present Polish state of affairs falls at the transition from (2) to (3). To facilitate this, full production control is required, but since no expensive equipment can be afforded, simple flow rate, pressure, and temp measurements must be made, gas recycled, and gas to liq ratio maintained between 200 and 400 cu. m/tonne.

Once this is accomplished, steps must be taken to enter into the third phase by provision of scientifically trained staff and laboratory facilities. M. S.

1524. Analysis of underground pump action by hydraulic dynamograph. L. Szefer. *Nafta* (*Krakow*), 1952, **8**, 179–83.—The dynamograph is an engine indicator in which pressure is transmitted by means of liq-filled capillary to a recording unit. The one

described is DGP–1. The pumping action underground is transmitted by means of a polished rod to the hydraulic chamber of the dynamograph. Theoretical and actual graphs are given for correct and incorrect pumping action. M. S.

Oilfield Development

1525. 1952's new reserves fall short of 1951 peak. Anon. *Petrol. Refin.*, 1953, **32** (4), 90.—New U.S. reserves proved in 1952 totalled 3300 million brl, making an increase of 2·4% in total reserves of 33×10^9 brl. Reserves were then 12·4 times the annual production as in the previous year. R. D. S.

1526. Natural gasoline output to top 1952 high. Anon. *Petrol. Refin.*, 1953, **32** (4), 121–2.—U.S. production of natural gasoline and allied products is predicted to increase by 4·9% in 1953 to a total output of 231 million brl in the year. R. D. S.

1527. Italian oil and gas resources. F. Reeves. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37** (4), 601.—This paper is a revision of a report made in 1952 for the Italian Government in response to a request for assistance under the Productivity and Technical Assistance Programme of the U.S. Mutual Security Agency.

The author reviews the historical development of the Italian oil industry, and points out that in spite of numerous surface indications of petroleum and a search which has lasted nearly a century, only a few small oil and gas fields had been found up to the end of the last war. Since then, 6 large gas fields, one yielding oil, have been developed in the Po Basin on seismic structures.

It is concluded that the proved Italian petroleum reserves are estimated at 1 million metric tons of oil and 75 billion cu. m. of gas. The Po Basin will undoubtedly yield additional gas reserves from Upper Tertiary and Quaternary formations in the central and eastern regions. The area offering the best oil and gas prospects in pre-Upper Tertiary formations lies along the southern margins of the Po plain. Pliocene and Miocene formations beneath well-defined seismic structures in the eastern half of the Marche–Abruzzi province offer fair oil and gas prospects. In the Lucanian province Eocene and Cretaceous formations should be tested. The Campanian province seems promising for minor accumulations of oil and gas.

Accumulations of oil and gas will probably be discovered in southern Sicily.

The author concludes that there are few, if any, geological provinces in Europe that offer as promising prospects, and full exploration is warranted in the 5 major basins. E. N. T.

1528. Science and technique in Soviet Union—further development of Soviet petroleum industry. B. Block. *Nafta* (*Krakow*), 1952, **8**, 189–90.—A summary of a report by the Soviet Minister for Petroleum Industry on development over a period 1940–51 as published in March–Apr. 1952 issue of *Planned Economy*. M. S.

Transport and Storage

1529. Largest diameter, biggest-capacity crude line. P. Reed. *Oil Gas J.*, 11.5.53, **52** (1), 107.—Ultimate capacity of this 26-inch dia line from West Texas to Gulf Coast will be 440,000 b.d. Distance is 577 miles, and 6 semi-automatic pumping stations have a total of 29,000 h.p. Mercury switches safeguard operations. X-ray radiographic inspection of welds was carried out throughout system. G. A. C.

1530. Underground storage. H. R. Thomas. *Oil Gas J.*, 1.6.53, **52** (4), 95.—Underground storage capacity for liquefied petroleum gas is now over 3 million brl, having increased from 2 million brl available at end of 1952.

Estimated 1954 capacity totals 8½ million brl. G. A. C.

1531. Underground storage of hydrocarbons today. G. H. Billue. *Petrol. Refin.*, 1953, **32** (4), 136–8.—A review of the development of underground storage during the last 3 years to the present projected total capacity of 7,000,000 brl. The methods used in salt beds are described, and the proposed development in hydratable shales and the use of lined cavities noted. R. D. S.

Refinery Operations

Refineries and Auxiliary Refinery Plant

1532. Transfer gasoline plant to West Texas in record time. A. L. Foster. *Petrol. Engr*, Feb. 1953, **25** (2), C44.—To save gas and recover light hydrocarbons, a natural gasoline and gas treating plant was moved, thus halving the time needed to erect a new one. The throughput capacity is 6 million cu. ft. of gas per day. The plant is a conventional oil absorption unit, the gas passing through an Amine type desulphurizing unit before delivery to the consumer. Included in the fractionator system is a de-ethanizer, depropanizer, and debutanizer. The debutanizer bottoms product is a natural gasoline, an average yield from the gas as received being 3 gal/1000 cu. ft., total liq. G. H. G.

1533. Pacific northwest shaping up as an important refining centre. G. M. Wilson. *Petrol. Refin.*, 1953, **32** (4), 87–8.—Refining capacity on the U.S.–Canada border is to be increased to handle 120,000 b.d. of crude delivered by the Trans-Mountain pipeline from Alberta. R. D. S.

1534. Moose Jaw, Canada, refinery expansion. C. F. Tears and C. F. Tears, Jr. *Petrol. Engr*, Feb. 1953, **25** (2), C5.—The geographical location, with its effect on product requirements, specifications, the utilities, and mechanical details, gave rise to unusual problems. In 1950 the refinery was operating at a charge rate of 6000 b.d. of crude, in topping, vacuum reduction, and thermal cracking operation. With the development of the Alberta fields, a crude capacity of 10,000 b.d. and a large increase in cat cracking resulted.

The units are described, with outputs and overall yields from the cat unit given. The complete installation is of the "combination" unit type, with the continuous flow of hot and intermediate stocks from one operation to the next in line and with complete integration of controls and auxiliary facilities. All the major new units are grouped around the pumps and control house. G. H. G.

1535. Moose Jaw refinery serves two provinces. H. C. Plummer. *Petrol. Engr*, March 1953, **25** (3), C18–19.—High octane gas is produced by a fluid cat cracking unit, where the H : C ratio is changed, and size and range of the hydrocarbons altered. Other installations include a cat polymerization unit and delayed coking and gas recovery units. A flow chart of the 15,000-b.d. refinery is given. G. H. G.

1536. Oil products from heavy Canadian crudes. G. A. Richardson. *Petrol. Engr*, Feb. 1953, **25** (2), C40–2.—Wilrich Petroleums Ltd is engaged in exploration and development of oil and natural gas. Plant designed to process a crude high in asphalt content and infused with salt, water, and some sand. Blown and straight-run are two types of asphalt produced at the refinery. The straight-run is used mainly for road surfacing. Of the light end fractions, the diesel fuel is especially useful at low temp. G. H. G.

1537. Refining in Mexico. Pt IV. Pemex building new lube plant. J. P. Thornton. *Petrol. Process.*, 1953, **8** (5), 710–12.—The two-year-old refinery at Salamanca has begun to install a plant to make 2500 b.d. of finished lub oils and 65 tons/day of finished waxes. The present refinery with a crude charging capacity of 30,000 b.d., receives its crude supply from Poza Rica by pipeline. The major processing units in use at this refinery are a McKee dist unit and a Dubbs thermal cracking unit of 4000 b.d. capacity.

Owing to the salty nature of the crude, 150 to 160 lb/1000 brl, there have been difficulties with plugged heater and exchanger tubes. A heater washing technique has been installed to overcome this recurring problem. This saltiness makes cat desulphurization a necessary part of the refinery scheme, not only to reduce the sulphur content, but also to reduce the amount of T.E.L. required to meet octane specifications.

A schematic block diagram of the process operations at Salamanca is given, together with a table showing a typical day operation. J. W. H.

1538. Refinery expansion in Eastern Hemisphere. V. S. Swaminathan. *Petrol. Engr*, March 1953, **25** (3), C9.—The developments in the AIOC installations outside Iran are described, following the loss of Abadan. There are 16 refineries outside Persia, and by 1955 a refining capacity of 224,000,000 brl/year will result, which is nearly the peak reached before Abadan was closed. Throughputs at refineries associated with the AI group are given with plant details, and mention made of the plans to set up 5 UOP platforming units. G. H. G.

1539. Revised plant makes "new" one. A. L. Foster. *Petrol. Engr*, Feb. 1953, **25** (2), C34–6.—The addition of a 7200-b.d. fluid cat cracker and revision of the flow in the existing plant resulted in a new refinery. The problem was that of having too much residual fuel oil and adequate quality production of motor fuel with thermal cracking gasoline. Plant operation is described.

From the polymerization unit, polymer is obtained approximating to 10% of the cracking unit charge. Future plans are for the installation of butane storage and revamping of the polymerization unit to produce liquefied petroleum gas.

G. H. G.

1540. On-stream maintenance—what and how. J. O. Thoen and L. G. Foster. *Petrol. Engr*, Feb. 1953, **25** (2), C26.—On turnarounds, the work should be planned for the minimum downtime, whereas with on-streams maintenance the time element applies to a lesser degree. The aim should be to limit, as far as possible, the work of the turnaround to installation of equipment that has been made ready during the on-stream interval.

Stress is laid on preventive maintenance when the plant is designed for max efficiency and economy in performance of work. Two points to lessen the downtime are cited: the care of equipment by operators; and the daily inspection of equipment by mechanics in co-operation with the operators. The aim of maintenance should be to find a standard for everything. G. H. G.

1541. Relative costs of alternate types of reactor vessel construction. I. E. Boberg and W. R. Fickett. *Petrol. Process.*, 1953, **8** (5), 690–2.—Some of the economic aspects are presented of pressure vessel design as influenced by a consideration of graphitization of the metal at elevated temp. Both field-erected and shop-built vessels are considered, and the data are given in both cases for various materials and temp, and cost factors relative to cost of an internally insulated vessel of mild steel operating at a max of 650° F.

The welding problems that present themselves are also discussed. J. W. H.

1542. Seven factors to preventive maintenance of centrifugal pumps. F. B. Applegate. *Petrol. Refin.*, 1953, **32** (4), 134–5.—The factors given are design, materials, workmanship, selection, location, and installation of the pump, and the work of the plant engineer. An outline of a preventive maintenance programme is given. R. D. S.

1543. Some characteristics of an oil ejector pump. E. Tajima, K. Kaneko, and A. Katayama. *Rev. sci. Instrum.*, 1953, **24**, 323–5.—The critical breakdown pressure, below which a decrease in fore pressure no longer gives any substantial change in the fine pressure, is found to be proportionate to the amount of oil vapour ejected from the nozzle. The reason for this is discussed.

A short investigation into the factors influencing the pumping speed on an ejector pump is also reported. H. C. E.

1544. Thermal stresses in piping systems. Pts II and III. W. E. Wilbur. *Petrol. Refin.*, 1953, **32** (4), 163–8; **32** (5), 174–8.—A presentation of further data for the design of piping systems.

The final part of the series of design data covers 3-plane structures and expansion loops using welded fittings. R. D. S.

1545. What is "NPSH"? D. R. Rankin. *Petrol. Refin.*, 1953, **32** (5), 162–5.—An explanation of the physical significance of the net positive suction head as applied to pumps. Strobotactic photographs of the development of cavitation within a centrifugal pump are given. R. D. S.

1546. How serious is graphitization? R. J. Fiorentino and A. M. Hall. *Petrol. Refin.*, 1953, **32** (5), 132–6.—A report of the API Subgroup on deterioration of steels at high temp covering 170 samples of steel plate or pipe which had been in service at 800° F or above for 4 years. 6·1% of the plate steel samples cracked in a cold bend test due to graphitization. The results so far indicate that carbon–molybdenum steels are markedly more resistant to graphitization in refinery equipment than carbon or carbon–silicon steels. R. D. S.

1547. A new approach to tray design. A. C. Eld. *Petrol. Refin.*, 1953, **32** (5), 157–61.—The author considers that the suspension equation normally used in calculating allowable vapour velocity is not based on the fundamental factors governing tray operation. He proposes a jetting equation based on transfer of kinetic energy which he claims gives better results, especially for vacuum and high pressure towers. Experimental operating and design data for perforated trays are also presented, and a description of a corrugated, perforated, plate-type tray, which decreases tower cross-sectional area without decreasing total plate area, is given. R. D. S.

1548. Clad steel in petroleum equipment. A. Hoersch. *Petrol. Process.*, 1953, **8** (5), 700–3.—Clad steels, although useful materials for the petroleum industry, cannot be used in every case. In some instances it is better to employ carbon steels. 6 examples are given of equipment material selection which are considered as "borderline cases." These cases include a caustic regenerator, acid sludge process, vacuum column, and crude fractionator.

The properties of clad steels and the methods and techniques used in their welding and fabrication are given. Many recommended operating conditions for these welding processes are also presented in tabular form. J. W. H.

1549. Flare stacks of unusual design. Anon. *Engineer, Lond.*, 1953, **195**, 711–12.—5 flare stacks erected at U.K. refineries of AIOC are each 250 ft high by 2 ft dia. Stacks are suspended inside stayed lattice mast of triangular cross-section, thus reducing cost and simplifying foundation problems, and designed for max waste gas flow of 1·5 million cu. ft/hr, flame length then being 50 ft. Top 11 ft is stainless steel, lined with refractory, with flame arrestor immediately below this. Ignition is by pilot 1-inch pipe, relit by an open 3-inch propagating tube containing two spark plugs. Insulation on H.T. cables to spark plugs is compressed MgO powder, to withstand heat of flare. A. C.

1550. Heat transfer. B. E. Lauer. *Oil Gas J.*, 4.5.53, **51** (52), 143.—Pt 33 of the series continues with coeff of heat transfer through film between outside surface of bank of cool tubes, a warm gas, and a warm liq. G. A. C.

1551. Heat transfer and fouling of fluidized beds. H. L. Olin and O. C. Dean. *Petrol. Engr*, March 1953, **25** (3), C23.—"Fouling" denotes the deposition of an adhesive layer on each separate granule of a system of finely divided solids. Ottawa sand was chosen for use as the solid medium because of its close approximation to sphericity. Fresh and regenerated silica alumina was chosen as cat. Points discussed are: (1) variations in heat transfer in beds of particles fluidized with air appear to be a direct function of particle motion and an inverse function of viodage for a given solid—heat transfer is a maximum in upper range of smooth fluidization; (2) effects of fouling on heat transfer are proportional to the influence such fouling exerts on particle motion and viodage; (3) at air current rates above the smooth range flow, the retardation of motion of the particles of rougher surface is reflected in an increase in ratio of observed pressure drop to that computed from the weight of the bed; (4) values of film coeff for sands ranged from 65 to 105, and for cat from 50 to 86 B.Th.U/ft²/hr/°F.

Curves of film coeff vs Re, fraction of viods vs Re, and Nu vs Re are given. G. H. G.

1552. Eliminate compressor operating problems. L. J. Murphy. *Petrol. Refin.*, 1953, **32** (4), 173–5.—The last of a series, this article answers some of the most common problems met with in the operation of a compressed-air system, such as low air pressure, air leaks, and starting and loading of compressors. R. D. S.

1553. Compressor calculation—3, 4, 6. R. W. Brooks. *Oil Gas J.*, 4.5.53, **51** (52), 139; 11.5.53, **52** (1), 133; 1.6.53, **52** (4), 109.—Part 3 deals with the correlation of specific heat data; graphs show generalized Cp and specific heat data for natural gas.

The next part deals with calculating compressor h.p.

Pt 6 gives 2 sample compressor calculations. G. A. C.

Distillation

1554. To help you design fractionators. Pt III. Stripping of quaternary mixtures. R. R. White. *Petrol. Process.*, 1953, **8** (5), 704–9.—4 components constitute the simplest multi-component system, and the basic relationships which apply to quaternary systems apply in general to mixtures containing more components.

An example problem is presented, giving the methods of calculating the minimum reboil ratios, the composition of the bottoms product, and the infinite stage zones for various cases of concentration of the fourth component. J. W. H.

1555. Inventiveness in petroleum industry—temporary blocking device for use in repair of vacuum distillation plant. J. Konior. *Nafta* (*Krakow*), 1952, **8**, 199.—Description and drawings. M. S.

Absorption and Adsorption

1556. Take this short cut in computing absorber material balance. R. B. Thompson and E. D. Frigar. *Petrol. Refin.*, 1953, **32** (4), 145–8.—The article describes a method of making material balances on gasoline absorbers, where the feed stream includes recycle gas and light components in the lean oil, by half the usual number of computations. The method is illustrated by feed calculations involved in modernizing an old absorption plant. R. D. S.

Cracking

1557. How to instrument a fluid catalytic cracking unit. D. J. Bergman. *Petrol. Refin.*, 1953, **32** (4), 185–8.—A review of instrumentation dealing largely with regeneration control, cat density and head, and pros and cons of small indicating instruments in a simplified flow diagram on the panel. R. D. S.

1558. Gasoline reforming. K. Kachlik. *Nafta* (*Krakow*), 1953, **8**, 212–15, 265–70.—A summary of cyclization, hydroforming, polyforming, and platforming procedure equipment and results. Refs include 3 Russian and 2 Polish books. M. S.

1559. Patents. Ger.P. 872,204, 19.2.53. W. von Füner and O. Göhre, assrs to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. " in dissolution "), Ludwigshafen (Rhein). Process for carrying out cat reactions.

Ger.P. 872,241, 19.2.53. W. Flesch, assr to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. " in dissolution "), Ludwigshafen (Rhein). Process for cracking hydrocarbons.

BrennstChemie, 1953, **34** (5–6). R. T.

Polymerization

1560. Patent. Ger.P. 872,492, 19.2.53. Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. " in dissolution "), Ludwigshafen (Rhein). Process for polymerization of olefins.

BrennstChemie, 1953, **34** (5–6). R. T.

Alkylation

1561. Patent. Ger.P. 871,746, 12.2.53. F. Rappen, assr to Ruhrchemie A.G., Oberhausen-Holten. Method for producing alkylated hydrocarbons.

BrennstChemie, 1953, **34** (5–6). R. T.

Chemical and Physical Refining

1562. Separation of naphthenic acids. H. L. Lochte. *Petrol. Engr.*, March 1953, **25** (3), C48.—A batch process is used to separate naphthenic acids from a middle or heavy petroleum fraction. In spite of precautions, naphthenic acid concn of commercial acids ranges from 65 to 95%, impurities being mainly phenols and hydrocarbons, dissolved or emulsified in the acids. The dark colour is partly removed by clay treatment, and for further refining, treat with sulphuric acid or distil. Vacuum dist yields lighter coloured products and a narrower boiling mixture, but at increased cost.
G. H. G.

1563. Patent. Ger.P. 872,692, 19.2.53. A. Horn, assr to Farbwerke Hoechst, formerly Meister Lucius & Brüning. Process for purifying acetylene.
BrennstChemie, 1953, **34** (5–6). R. T.

Special Processes

1564. Roosevelt oil has first Platreater. Anon. *Petrol. Refin.*, 1953, **32** (5), 142.—A side cut of the Michigan crude used is fed to the Platreater, where hydrogenation of olefins and destruction of sulphur compounds takes place. The product is combined with an aromatic product from a Platformer and the aromatics refined by a Udex solvent refining unit. Aromatics output is 400 b.s.d. from the Platformer and 250 b.s.d. from the Platreater. R. D. S.

1565. New Shell hydrodesulphurization process shows these features. H. Hoog, H. G. Klinkert, and A. Schaafsma. *Petrol. Refin.*, 1953, **32** (5), 137–41.—A discussion of the cat hydrogenation process to remove sulphur from middle distillates, using a trickle of oil in the presence of a relatively small amount of hydrogen gas and a suitable cat. Conditions used are 300 to 750 p.s.i. and 650° to 750° F so that most of the feed remains unvaporized.

This process uses a cobalt–molybdenum mixture on a bauxite carrier as cat, which is claimed to possess a satisfactory degree of selectivity and a life of one year before needing regeneration. A straight-run middle distillate is found to require 50 s.c.f. of hydrogen per lb of sulphur removed, *i.e.*, about 4 mol of hydrogen per atom of sulphur. 85 to 90% sulphur removal is achieved, and the liquid by-products are high octane gasoline or are suitable for blending into kerosine or high speed diesel fuel. The effect of hydrogen sulphide in the recycle gas is found to be negligible, as is the effect of concentrations of methane up to about 10%. R. D. S.

1566. How feed stock and severity affect Houdriforming economics. H. D. Noll, T. A. Burtis, and J. C. Dart. *Petrol. Refin.*, 1953, **32** (5), 113–16.—The paper reports, in graphical and tabular form, the results of an investigation into the effect of feed-stock boiling range and severity of operation on the economics of cat reforming of naphtha. The conclusions drawn are that it is best to reform to a moderate severity, *i.e.*, 78 to 82 O.N., the narrowest boiling range naphtha with which it is possible to reach the desired octane level. R. D. S.

1567. TCP process offers these advantages. L. P. Evans, K. E. Magin, J. I. Savoca, and H. W. Shea. *Petrol. Refin.*, 1953, **32** (5), 117–22.—The development work on the Thermofor continuous percolation process covering the operation of a 500-b.d. pilot plant is briefly reviewed, the commercial process design being described in detail.

The process involves oil decolorizing and clay washing in a continuous counter-flow system, clay drying and regeneration in a clay-burning kiln. Conventional percolation clays are used, and no naphtha dilution is required, even on heavy stocks. Figures are presented to show this process to have lower investment costs than static-bed percolation and lower operating costs than hot contacting. R. D. S.

1568. Three new refining processes. Anon. *Petrol. Process.*, 1953, **8** (5), 683–5.—The autofining, hydrodesulphurization, and TCP processes have been developed for the use with existing refining processes.

The autofining process, operating with naphtha and tractor fuel feed stocks in blocked operation, uses a mixed cobalt and molybdenum oxides on alumina type of cat

in a mild steel reactor at 100 p.s.i.g. and 780° F. The sulphur content of the feed can be brought down from 0·6 to 0·1 wt % in the case of tractor fuel.

The " trickle hydrodesulphurization " is suitable for a variety of feed stocks. The reactor uses a number of cat beds with the same cat as the autofining process, with a temp of 710° F and 750 p.s.i.a. The sulphur content is reduced to approx 0·3 wt % from an initial percentage of 2·9 under the 500° F cut.

The Thermofor continuous percolation process (TCP), includes a decolorizing and wash tower, and also auxiliary equipment for clay and oil handling. The 500-b.d. pilot plant showed yields ranging from 53 to 193 brl of oil/ton of clay. The clay used was 30 to 60 mesh fuller's earth. J. W. H.

1569. Fluidization : an important new industrial technique. A. R. Myhill. *Mech. World*, May 1953, **133** (3406), 214.—Applications of fluidization to material conveying and reaction processes are considered, and its limitations are discussed. Some present applications, including the continuous cat cracking of petroleum, are mentioned, and it is considered that many more and widely different opportunities exist for the application of fluidization technique. 2 refs. T. T.

1570. The Autofiner at Llandarcy. V. S. Swaminathan. *Petrol. Engr.*, March 1953, **25** (3), C21.—The Autofiner consists of a furnace to heat the oil, a reaction vessel containing a cat causing a desulphurizing action, and a gas system to preheat the recycle gas which enters the reactor with the vaporized oil. A small amount of gas, mainly hydrogen, is generated and circulated continuously, removing the sulphur in the oil as H_2S, which is burnt. No external gas is needed.

The process deals with wide range of oils, motor fuel, diesel fuel, and operates continuously except when regenerating the cat. Capacity 3500 b.s.d. G. H. G.

1571. A refinery as a chemical factory. A. L. Foster. *Petrol. Engr*, March 1953, **25** (3), C3–4.—The article describes the operation of a Platformer-Udex unit for the role of upgrading naphthas as motor and aviation fuel components, and of dehydrogenating-aromatizing lighter fractions to synthesize and isolate certain aromatics to meet increasing demand. To handle naphtha of low octane rating and high sulphur content, a platformer unit was installed for the main conversion step, and a solvent extraction–fractionation unit to segregate various speciality products. A conventional fractionator column was used for the last step, and a Udex solvent extraction system for the initial concentration.

The unit is operated for motor fuel for a predetermined period, and then switched to aromatics production. Charge stock is the higher of two cuts from pentane-free naphtha. The Udex unit operates on a separate system, using diethylene glycol as solvent. G. H. G.

1572. Patents. Ger.P. 871,448, 12.2.53. W. Lorenz, assr to Farbenfabriken Bayer, Leverkusen-Bayerwerk. Method for producing esters of monothiophosphoric acids.

Ger.P. 871,150, 12.2.53. K. Miescher and P. Wieland, assrs to Ciba A.G. Basle. Method for producing newer alycylic ketones.

Ger.P. 871,758, 12.2.53. F. Boedecker, A. Heymons, and K. Schulze, assrs to Riedel-de-Haën A.G., Seelze-bei-Hannover. Method for producing hexachloro-*cyclo*hexane.

Ger.P. 872,202, 19.2.53. M. Aschenbrenner, assr to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. " in dissolution ") Ludwigshafen (Rhein). Process for electrolytic oxidn of chromate sol.

Ger.P. 871,888, 19.2.53. W. Ohme and W. Ziegler, assrs to Dortmunder Paraffinwerke G.m.b.H. Dortmund. Process for chlorinating liq aliphatic hydrocarbons.

Ger.P. 872,040, 19.2.53. H. Jonas and W. Thraum, assrs to Farbenfabriken Bayer, Leverkusen-Bayerwerk. Method for producing esters of phosphoric acid.

Ger.P. 871,890, 19.2.53. V. Hilchen and H. Patri, assrs to Farbwerk Hoechst, formerly Meister Lucius & Brüning. Method for producing alkali salts of monochloroacetic acid.

Ger.P. 872,041, 19.2.53. R. Sallmann and O. Albrecht, assrs to Ciba A.G. Basle. Method for producing water-sol, asymmetrical condensation products.

Ger.P. 872,343, 19.2.53. O. Stichnoth, assr to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. " in dissolution ") Ludwigshafen (Rhein). Method for producing *n*-propylamine.

Ger.P. 872,494, 19.2.53. K. Wallenfels and F. Duspiva, assrs to C. F. Boehringer & Soehne G.m.b.H. Mannheim-Waldorf. Method for producing amino acids.

BrennstChemie, 1953, **34** (5–6). R. T.

Metering and Control

1573. Oval gear meters for liquid measurements in the petroleum industry. V. Bernhardt. *Erdöl u. Kohle*, 1953, **6**, 150–2.—Various types are described and illustrated and examples of their use given, *e.g.*, discharge of pre-determined quantity, discharge + price indication, blending. Accuracy is $\pm\frac{1}{2}\%$, operating temp up to 90° to 100° C, above this temp (up to 160° C) and for low-flash products a magnetic coupling is used in place of a stuffing box. As meters operate volumetrically, a preceding gas separator is necessary if liq is likely to contain bubbles that would falsify reading. V. B.

1574. Measurement and regulation of flow by remote control. G. C. Wilson. *Oil Gas J.*, 1.6.53, **52** (4), 82.—Two telephone circuits performing telemetering and control functions for a remotely controlled terminal station are described. They operate on a 30-inch pipeline of Southern Countries Gas Co., Calif. The station has been in operation some 9 months without undue service requirements. G. A. C.

1575. Self-cleaning antimony pH electrode. P. Hart and R. C. King. *Oil Gas J.*, 1.6.53, **52** (4), 113.—A few feet of liq head is used to keep a glass marble rubbing along the surface of the antimony electrode. A diagram of the assembly is given. G. A. C.

1576. Pressure-rate alarms. P. Hart and R. C. King. *Oil Gas J.*, 4.5.53, **51** (52) 141.—A rate-action pressure alarm is described which is used to indicate sudden changes in operating conditions in reaction systems where these conditions are critical. A diagram is given. G. A. C.

1577. Organization of instrument departments in typical process industries. S. S. Shaffer. *Instrumentation for the Process Industries*, 1952, 10–17.—Brief details are given of the growth of instrumentation and instrument departments. The principles of organization, a master plan, determination of types of work, responsibilities, and personnel are discussed. The organization of instrument departments of 7 large U.S. refineries and chemical manufacturing companies are outlined. The increasing complexity, both in type and design, of instruments and new types developed over the last 10 years is noted. W. H. C.

1578. Instrumentation for disposal of industrial waste. J. G. Dobson. *Instrumentation for the Process Industries*, 1952, 18–23.—Basic uses of waste-disposal instruments include survey, monitoring, and treatment-plant control. Conductivity, pH, flow, ratio control, and oxidn-reduction instruments are useful in identifying and measuring concentration of effluents. Charts, diagrams, and flow sheets illustrate the data recorded. W. H. C.

1579. A university-level course in process instrumentation. G. J. Farrar. *Instrumentation for the Process Industries*, 1952, 24–30.—The curriculum of this course in instrumentation is described and discussed under the following sections : introduction to instrumentation, measurements, responses of instruments, modes of automatic control, final control elements, characteristics of processes, application of control responses (modes) to various processes, automatic control systems. Charts, diagrams, and flow sheets illustrating the data covered are shown. W. H. C.

1580. On-the-job training in instrumentation. J. A. Parker. *Instrumentation for the Process Industries*, 1952, 31–3.—Training in instrumentation of instrument engineers, instrument craftsmen, technical operating personnel, and plant operators,

during working hours, is described. Under each group the following points are considered: the scope of information covered; qualifications of the instructor; type of text and demonstrating equipment used; and whether instruction should be given in classes, meetings, or to individuals. W. H. C.

1581. Lub oil processing and instrumentation. E. W. Midlam and J. D. Dorsey. *Instrumentation for the Process Industries*, 1952, 41–6.—A brief survey is given of the processing in and the products obtained from the world's largest lub oil plant owned by the Cities Service and Continental Oil Corpn. The operations require about 800 instruments and 450 diaphragm-motor valves. Descriptions, diagrams, and flow sheets are given of the instrumentation of compressor control at the Duo-Sol unit, Furfural unit water-removal system, MEK dewaxing and propane systems. The rotameter installed on the hot raffinate line and meter seals are discussed. W. H. C.

1582. Process flow sheets and instrument control diagrams. W. L. Willoughby. *Instrumentation for the Process Industries*, 1952, 47–9.—Process flow sheets, process control diagrams, and engineering flow sheets can be simplified by eliminating sharp turns and intersections, and by using descriptive symbols. (Author's Abstract.) W. H. C.

1583. Trends in refinery instrumentation. Pt. 7—installation and maintenance. C. F. Johnson, Jr. *Petrol. Engr*, Feb. 1953, **25** (2), C21.—The actual installation of the Dynamaster instrument is relatively simple. Various considerations are outlined, including routine procedure for checking the instruments, and general care and methods of checking in case of failure. Dynamaster instruments are engineered and manufactured to provide high accuracy and dependability, with easy accessibility for maintenance. G. H. G.

1584. Trends in refinery instrumentation. Pt. 8—installation and maintenance of orifice meters. S. D. Ross and J. Procopi. *Petrol. Engr*, March 1953, **25** (3), C5.—The importance of correct meter installations is stressed. Precautions when installing an orifice plate are: (1) proper direction, with sharp and square edge facing upstream, and orifice opening concentric with the pipe; (2) proper installations of taps. The method of connecting the meter is given, and common causes of orifice plate trouble are shown diagrammatically.

With a mercuryless-type meter, the need for condenser pots is eliminated. For dry-gas measurement, orifice connexions should be on top of the pipe. When metering corrosive gases or liq, an inert purge gas should be used to prevent corrosion of the meter body. To obtain the best performance when using a differential converter, a location free of vibration (within 3 or 4 ft of the orifice) should be chosen. The installation positions of the converter are given for steam, liq, and gases.

For consistent accuracy and long life, periodic cleaning, checking, and calibration are essential. A flow meter maintenance schedule is given. G. H. G.

1585. Patents. Ger.P. 871,372, 12.2.53. H. Garthe, assr to Siemens & Halske A.G., Berlin and Munich. Device for automatic regulation of quant relation of 2 through-flows.

Ger.P. 871,841, 12.2.53. F. Kirchoff, assr to Deutsche Gerätebau-A.G. Geisweid. Sounding-pipe for introducing a sounding-rod into containers for flammable liq, etc.

Ger.P. 872,276, 19.2.53. F. Lieneweg, assr to Siemens & Halske A.G., Berlin and Munich. Transmitter for measuring conductivity of liq.

BrennstChemie, 1953, **34** (5–6). R. T.

PRODUCTS

Chemistry and Physics

1586. Correlating total pressures of binary systems. R. Gilmont, T. Roszkowski, and D. F. Othmer. *Petrol. Refin.*, 1953, **32** (5), 167–72.—This is an extension of Othmer's method for estimating vapour pressures, and gives a straight line correlation by plotting

at constant composition the values of reduced total pressures of one binary system *vs* corresponding values for another at the same reduced temp. Data for the plotting of 6 paraffin hydrocarbon binaries is presented, and it is hoped to develop a generalized method for the prediction of total pressures of any paraffin binary system.

R. D. S.

1587. Viscosity, thermal conductivity, and specific heat of steam at elevated pressures and temperatures. I. Granet and P. Kass. *Petrol. Refin.*, 1953, **32** (5), 179–81.—A graphical correlation of the most recent data, including alternative viscosity data due to Timroth and to Lieb's correlation of Purdue's data. R. D. S.

1588. Spreading of liquids on low energy surfaces. VI. Branched chain monolayers, aromatic surfaces, and thin liquid films. H. W. Fox, E. F. Hare, and W. A. Zisman. *J. Colloid Sci.*, 1953, **8**, 194–203.—Contact angles (θ) have been measured for a variety of liq, including hydrocarbons, on monolayers of branched chain and cyclic polar–non-polar mol on a Pt surface. For all monolayers the plot of $\cos\theta$ *vs* surface tension σ gave straight lines, of which extrapolation to $\cos\theta = 1$ gave the critical surface tension σ_c characteristic of the surface. From these and preceding experiments, it appears that the further the mol structure of the monolayer is removed from a linear aliphatic structure, the more wettable will be the surface, *i.e.*, the higher must be σ of the organic liq to produce non-wetting. Monolayers comprising the edges of aromatic rings are more easily wetted than those comprising methyl groups. The presence of carboxyl groups in the monolayer contributes strongly to the ease of wetting, and it is concluded that the free surface energy of adsorbed liq or solid films depends only on the atomic groups in the surface and their packing. H. C. E.

1589. Absorption and fluorescence spectra of *p*-terphenyl in toluene. C. F. Ravilious. *Rev. sci. Instrum.*, 1952, **23**, 760.—The absorption and fluorescence spectra of *p*-terphenyl at 0·5% concn in toluene is shown graphically between the wavelengths 3200 and 4200 Å. H. C. E.

1590. Hysteresis of contact angle of water on paraffin [wax]. Effect of surface roughness and of purity of paraffin. B. R. Ray and F. E. Bartell. *J. Colloid Sci.*, 1953, **8**, 214–23.—Contact angles of water on carefully purified paraffin wax were measured by the tilting plate method, vertical rod method, controlled drop volume method, and capillary drop method. Of these the first was the least accurate and convenient. The wax surfaces were formed in several ways in air and in vacuum or nitrogen.

When the wax surface was formed by volatilization on to a glass surface in vacuum, the advancing θa and receding θr contact angles were sensibly the same, 112°. Differences between θa and θr of between 5° and 35° were found for less smooth surfaces, for thicker surfaces, and for surfaces formed in air. The roughness of the surface appears to increase θa, but decrease θr, so that the average value is not affected. θar for the unpurified wax was slightly less than for the purified wax. K. C. E.

1591. Emulsions and their production. T. Temme. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (1), 22.—Low-pressure homogenization by vortical motion is described and compared with high-pressure procedure. Both plants are shown in section.

R. T.

1592. Patents. Ger.P. 871,343, 12.2.53. Bad. Anilin- & Soda-Fabr. (I.G. Farbenindustrie A.G., "in dissolution"), Ludwigshafen (Rhein). Drying medium for drying oils.

Ger.P. 815,514, 12.2.53. R. Schiel and L. Hahn, assrs to Wintershall A.G. Celle and L. Hahn. Process for separating oil emulsions.

BrennstChemie, 1953, **34** (5–6). R. T.

Analysis and Testing

1593. Learning how to use dimensional analysis. I. H. Silberberg and J. J. McKetta. *Petrol. Refin.*, 1953, **32** (4), 179–83; (5), 147–50.—Outlines the uses of dimensional analysis, and covers the advantages and disadvantages of various systems of dimensions.

The article goes on to describe the correct use of dimensional systems and gives 3 examples. 24 common variables are expressed in all 3 of the primary dimensional systems. The importance of dimensional homogeneity is discussed and illustrated in detail. R. D. S.

1594. Correct LTFD analysis for vapour hold-up. S. T. Preston. *Petrol. Refin.*, 1953, **32** (4), 142–4.—The latest corrections for systematic errors in low temp fractional analysis are given graphically, relating vapour hold-up to column temp and pressure for automatic and semi-automatic columns. R. D. S.

1595. Molecular balance and its application to gas analysis. M. Szczupaczynska-Tokarzewska. *Nafta (Krakow)*, 1952, **8**, 152–5, 183–5.—Description, with diagram and sources of error. M. S.

1596. Gas analysis using mass spectrograph. W. Zuk. *Nafta (Krakow)*, 1952, **8**, 206–8, 238–40.—The construction and working of Aston's mass spectrograph is explained. 3 samples of mixed hydrocarbons are analysed as an illustration. The presence of CO_2, N_2, and O_2 interferes, giving peaks indistinguishable from some hydrocarbons. M. S.

1597. Recording Raman spectrometry in analysis of petroleum products. L. Robert. *Rev. Inst. franç. Pétrole*, 1953, **8**, 175–82.—Three-prism Steinheil spectrometer has been adapted to operate pen recorder. Test reproducibility is 5%, sensitivity varies with type of compound (1% for C_6H_6, 2% for CCl_4, 30% for paraffins). Main obstacle to increased sensitivity is background noise of photo-tube and amplifier. Examples of application to analysis of gasolines, gas oils, and white oils are briefly described. For white oils, Raman spectra can show differences in samples having identical infra-red spectra; thus Raman procedure, although having considerable limitations, can be a valuable adjunct to other analytical methods. V. B.

1598. Fluorescence in functional organic analysis. M. Heros. *Chim. anal.*, 1953, **35**, 114–16.—U.V. (Wood filter) examination of oil fractions adsorbed on activated alumina from pet ether solution and subsequently eluted enables presence of coal-tar products (anthracene oil) to be detected in pet. Fluorescent spectra of latter forms one wide band whilst coal tar material has several narrow bands. List of fluorescent indicators (with pH range and colour-change) is also given. V. B.

1599. Direct titration of monomethylaniline in gasolines. J. Fessler. *Erdöl u. Kohle*, 1953, **6**, 265.—Monomethylaniline, used as anti-knock, can be detected by extracting fuel with dil (10%) H_2SO_4, making extract alkaline with NaOH, and extracting with ether; the base remains on evaporating off the ether. Quantitative estimation by titration of acid extract with bromide–bromate soln. Simpler procedure is to titrate gasoline directly with 10N-perchloric acid in glacial acetic acid, using methyl violet as indicator. Soln is prepared by dissolving 10·8 ml of 60% perchloric acid in 1 litre glacial acetic acid to which has been added 15 ml acetic anhydride, to ensure absence of free H_2O. Test reproducibility is 0·1%. For gasolines containing both monomethylaniline and T.E.L. the former must be removed by dil H_2SO_4 before estimation of latter, otherwise troublesome bromination products result. V. B.

1600. Quantitative isolation of fatty acids in petroleum oils. L. R. Dickson and R. R. Jay. *Petrol. Engr*, March 1953, **25** (3), C45–6.—The separation of fatty acids from various mixtures of pet products often presents serious emulsion breaking problems, and the techniques in this method eliminate most of these problems, giving satisfactory results on a wide variety of samples. Fatty acids obtained are generally dark coloured, and may be purified by means of a pet ether separation. G. H. G.

1601. Determination of asphalt content of a lubricating crude oil residuum. F. J. Higgins. *Petrol. Engr*, March 1953, **25** (3), C46.—Asphalt content is determined from the colour of 3 or 4 naphtha soln of a crude residuum, which have been contacted with different quantities of Filtrol contact clay, and the colours of which fall within a prescribed colour range. The method was originally based on the fact that for several

residua first investigated, a point was reached where additional clay added to the naphtha soln of a residuum had little effect on the visc of the remaining oil. The colour range was chosen which indicated this condition. Total time for one determination is about 8 hr. G. H. G.

1602. Determination of mercaptans in finished gasolines. M. R. Beychok. *Petrol. Engr*, Feb., 1953, **25** (2), C38.—Iron alum end-point is difficult to determine in a finished gasoline due to: (1) dye colour; (2) the fact that commonly used gum-inhibitors develop a red colour with silver nitrate. Colour due to the dye may be removed by adding approx one-half of decolorizing charcoal to 100 cc of the gasoline, shaking, and filtering. To remove the colour interference due to the gum inhibitor, scrub with 1 : 1 nitric acid soln, decant the gasoline, and filter to remove water and/or acid. The determination is then carried out as usual. G. H. G.

1603. Centipoise viscosity of crude oils. Anon. *Petrol. Engr*, Feb. 1953, **25** (2), C37–8.—Calculation of visc from Saybolt Viscosity and ASTM tables. If the formation temp is too high for an accurate Saybolt to be run, choose two lower temp, and plot on the ASTM standard visc–temp chart. Extension of the straight line joining the two points is then used to determine visc at the desired temp. G. H. G.

1604. Cetane number from aniline point. O. M. Duncan. *Petrol. Engr*, Feb. 1953, **25** (2), C37.—Simplified apparatus is described for the determination of aniline points, with the calculation of diesel index and cetane number to within two of those on the C.F.R. engine. The procedure is sufficiently accurate for 90% of the routine testing of diesel fuels. G. H. G.

Crude Oil

1605. Study of the evaluation of Lacq crude. Anon. *Rev. Inst. franç. Pétrole*, 1953, **8**, 115–28.—A pilot plant study, mainly directed to lub oil production. Topped (82·5%) crude having d_{15} 0·981, asphaltenes 17·5%, 39% vol at 471° C was vac dist, furfural refined, and M.E.K. dewaxed. Lubs were redist and clay (4%) treated at 200° C. Wt % yields (on crude) were gas oil 19·7, light lub (5·4 cs at 210° F) 3·3, medium lub (10·2 cs) 4·2, heavy lub (23·1 cs) 1, asphalt 36. Lubes had V.I. 92 to 107, and gave successful engine test results. Tests are given on asphalt and cut-backs with lub extracts; the latter can be used as second-grade oils (tests given). Cat cracking of waxy dist is feasible, but high S (2·5%) might prove troublesome. V. B.

Gas

1606. New gasoline plant features unusual stripping steam generation. W. O. Blenkarn, R. E. Pierson, and J. F. Pollock. *Petrol. Refin.*, 1953, **32** (4), 139–41.—A description is given of Stanolind's Three Bar gas injection and gasoline plant in West Texas which commenced operation in Jan. 1953 with an ultimate capacity of 20 million s.c.f.d. A feature is the reduction of steam requirements by the use of 2 direct gas-fired heaters, one on the rich oil and the other on the heat medium circuit; this allows all other process heating to be done by circulating hot oil which also generates the stripping steam required. The heating medium leaves the heater at 525° F and returns to a surge tank at 340° F where a gas blanket is maintained at 30 p.s.i.g. Several flow diagrams of the plant are given. R. D. S.

1607. Petrochemical industry looks to liquified petroleum gas. B. R. Carney and R. E. Meyer. *Petrol. Refin.*, 1953, **32** (4), 123–7.—The supply and demand situation for LPG now and in the future is reviewed, and the uses of its main hydrocarbon components by the petrochemical industry are discussed. R. D. S.

1608. Conserving natural gas with packaged gasoline plants. G. T. Williamson. *Petrol. Refin.*, 1953, **32** (4), 149–52.—Packaged units are becoming popular in short-lived fields and locations remote from gas-gathering systems, and this article describes three types of these units—one to recover unstabilized gasoline, and the others for stabilized gasoline and LPG. Flow diagrams and approx performances are given. R. D. S.

1609. The propane unit of the Royalite Oil Company. A. G. A. Piercey. *Engng J., Montreal*, Apr. 1953, **36**, 375–7, 383.—This plant for the processing of Turner Valley natural gas, originally the property of the Western Propane Ltd., was purchased in July 1952, removed to a new site and modernized for improved operation and economy. It was put into operation in Oct. 1952. The advantages gained are that it reduces the personnel required, since steam and monoethanolamine soln will be supplied from the Madison Natural Gas Co's boiler house and scrubbing plant respectively. It should also increase the capacity of the plant as the inlet vapours will be available at slightly higher pressure. Descriptions and flow sheets are given of the propane absorption units and the dual dist units by which propane of over 95% is obtained and marketed.
W. H. C.

Engine Fuels

1610. Fuel-oil ash deposition in open-cycle gas turbines. A. T. Bowden, P. Draper, and H. Rowling. *Engineer, Lond.*, 1953, **195**, 639–42, 627–8, 659–60.—Refinery residual fuels may be blended with dist to produce fuels with visc 50 to 6000 Redwood I sec at 100° F, ash of such fuels may be $<0{\cdot}01\%$ up to about $0{\cdot}1\%$. Major elements of ash (*i.e.*, excluding those of concentration <10 p.p.m.) are Al, Ca, Fe, Mn, Ni, Si, Na, Va. It is probable that Fe, Ni, and Va exist as oil-sol organo-metallic compounds, *e.g.*, vanadium porphyrin, others in suspension or in soln in emulsified water. Oil sol metal naphthenates may also be present. Because of possibilities of running industrial gas turbines on residuel fuel, more attention is now being paid to ash composition. At temp in combustion chamber (*ca* 1600° C), all organo-metallic mols break down and form either oxides, or, by interaction with SO_2 or SO_3 produced by combustion of sulphur in fuel, sulphites or sulphates. Complexes such as $Na_2O.V_2O_4.5V_2O_5$ have also been identified in gas turbine deposits. In general, if compound has m.p. below 625° C, it will not be present in deposits. First tests (1949) using fuel of $0{\cdot}044\%$ ash, containing 16 p.p.m. Na as Na_2O and 295 p.p.m. V as V_2O_5 gave serious ash deposition, generally ascribed to the vanadium. Later tests using fuel of only 4·6 p.p.m. V_2O_5, but 1440 p.p.m. Na_2O, produced much greater build-up rate. Special tests introducing various organo-metallic compounds into dist fuel showed that Na produced greatest build-up, 40% increase in turbine resistance being proved as against 12% for V, and less for other metals. All metals other than Na reached an equilibrium value, but resistance due to Na continued to rise indefinitely. Two methods of reducing ash deposition proved successful : (1) Increasing fuel particle size and homogeneity of atomization, so that $0{\cdot}5$ to $1{\cdot}0\%$ of fuel remained unburned and was exhausted from turbine as carbon particles up to 50μ dia (not smoke). About half the ash was expelled in the carbon particles, and a strong scouring effect was produced ; the latter might be a limit to application of this method. (2) Introduction of various additives to convert the deposit to a volatile form. (Silicon as ethyl silicate most successful of compounds tried, but cost would be prohibitive.) In discussion, the following points were raised : (1) necessity for wide variation in gas turbine power output for marine work, especially warships, and hence possible difficulty in controlling fuel particle size under all conditions ; (2) trouble envisaged with salt-laden air intake to turbines at sea (1 p.p.m. salt in air corresponding to approx 100 p.p.m. salt in fuel) ; (3) corrosion difficulties in turbines due to deposits, as distinct from loss of performance ; (4) prevention of ash deposition on blades by blowing air through porous blade surface ; (5) changing nature of fuel, *e.g.*, by adding bitumen, rather than changing fuel particle size to expel ash in carbon particles.
A. C.

1611. Electric aids in determining the anti-knock characteristics of fuels. R. Vichnievsky. *Bull. Ass. franç. Tech. Pétrole*, 1953, **99**, 49–55.—Methods used for knock detection since 1921 are tabulated, and brief notes given on earlier electronic types. Philips detonation meter is described. Its sensitivity is greater than bouncing pin, and permits differentiation between closely similar fuels at a lower C.R. than for bouncing pin. Electronic knock detection in road tests (multi-cyl engines) is, so far, impracticable owing to interference from engine vibrations, but electronic apparatus is used for recording engine speed and ignition timing in such tests.
V. B.

1612. Properties and laboratory tests of automotive fuels. H. Wilke. *Erdöl u. Kohle*, **1953, 6,** 165–7.—Elementary discussion of tests (with references to DIN standards)

for gasoline and diesel fuel. German gasolines have 10% dist min at 65° C, 50% min at 140° C, 95% min at 200° C, max TEL 0·05 vol %. Diesel fuel must have min 90% at 370° C (or 80% at 350° C). Details of Hagemann and Hammerich cold filtration test given. Corrosion attack on Zn (presence of naphthenic acids) is also important, max permissible (100 by 10 by 1 mm sheet, 24 hr, 100° C, 50 ml fuel) is 4 mg. V. B.

1613. Cold room study of starting fluids. H. D. Young. *Petrol. Engr*, Feb. 1953, **25** (2), C10.—It is a complex problem to obtain comparative data of fuels and starting oils in diesel engines at low temp, as remote control is unsatisfactory. Factors discussed are: (1) influence of primary diesel fuel on cold starting—gain in minimum starting temp of 15° F or more may be obtained through fuel selection; (2) influence of some engine factors on cold starting—difficulties of valve sticking, injector sticking, injector malfunctioning, increased variation in compression pressures, variations in cranking battery output upon prolonged soaking at low temp; (3) point of starter fluid application for max effectiveness; (4) method of starter fluid application—methods evaluated over temp range +40° to 38° F, using the same fluid; (5) effectiveness of starting fluids—limit of effectiveness of currently available starting fluids is −25° to −30° F. A lower temp of starting is possible by raising the fluid temp.
G. H. G.

1614. Patents. Ger.P. 871,299, 12.2.53. M. Pier and E. Donath, assrs to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. "in dissolution"), Ludwigshafen (Rhein). Method for producing knockproof motor fuels by pressure hydrogenation of high-boiling hydrocarbons.

Ger.P. 871,488, 12.2.53. F. Domann, assr to Vereinigte Werkstätten Wittenau G.m.b.H. Berlin–Borsigwalde. Process for continuous water gas production.

Ger.P. 871,852, 12.2.53. W. Simon and W. Hirschberger, assrs to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. "in dissolution"). Gasoline treated with metallo-organic compounds.
BrennstChemie, 1953, **34** (5–6). R. T.

Gas Oil and Fuel Oil

1615. The influence of some antioxidants on the artificial ageing of turbine oils. Z. Stepek. *Bull. (Polish) Inst. Petrol.* (Supplement to *Nafta (Krakow)*, 1952, **8**), 1952, **2**, 8–9.—The paper concerns itself with relationship between natural and artificial ageing of turbine oils. The influence of oxygen, water, metals, temp, pressure, and light, as well as refining methods, were discussed. Several methods of artificial ageing were considered, and it was found that results obtained by method of extinction gives best agreement with normal ageing properties when the oil has been tested in a bomb at 150° C for 4 to 10 hr. Further, the influence of inhibitors on ageing has been tested by the above method, and the best results were obtained using *para*-hydroxydiphenylamine. M. S.

Lubricants

1616. Are you lubricating motors properly? F. H. Walker and W. J. O'Meara. *Petrol. Refin.*, 1953, **32** (5), 127–31.—A discussion of the results of a 5-year test on 37 motors, all of 25 h.p. or less, without lubrication. A 3-year lubrication interval for all motors and the use of high quality grease to reduce soap formation are proposed.
R. D. S.

1617. Electric motor lubrication. Anon. *Petrol. Process.*, 1953, **8** (5), 693.—A 5-year test with 37 motors (40,000 hr at 3600 r.p.m.) ranging from 7·5 to 25 h.p. completed by the Atlantic Refining Co. indicates that the time may come when motors will be able to operate continuously for this period on a single greasing. Although the bearings and housings were worn in some cases, continual improvements in bearings are expected to have a hand in future progress. J. W. H.

1618. A new method of testing oxidation stability of lubricating oils. H. Mosurski. *Nafta (Krakow)*, 1952, **8**, 186–8. (*From the researches of the (Polish) Institute of Petroleum*).—The new method consists of circulation of a quantity of lub oil (150 g) at the rate of 0·7 g/minute ±2% over a steel plate inclined at 15° heated to 250° C (±2° C) for 12 hr whilst any vapour is collected by suction. All oil is recovered and then carbon (Conradson), ash, and oxygenation analyses are made. As example of the working of this method several results are tabulated and compared with other methods. Repeatability is *ca* 20%, but this method allows to distinguish between oils with or without antioxidants, because instead of redistribution of oxygen between acids, esters, and carbonyls the new method gives a fall in oxidn to all 3 kinds of oxygenated products.

Thus this method is considered superior. M. S.

1619. Synthetics for jet engines. A. L. Foster. *Petrol. Engr*, Feb. 1953, **25** (2), C3–4.—Pure petroleum-based oils are inadequate to meet increasingly severe conditions imposed on lubricants and metals by the newer designs. Earlier engine bearing temp seldom exceeded 300° F, but in newer designs 450° F is not uncommon.

To obtain suitable oils, two main types of compound are used; (1) organic diesters; (2) polyolefin glycols. For aeration (jet engine) oils, esters have been widely studied. A good basis now exists for predicting the properties of variants and derivatives of the synthetics. Supplies of raw materials and intermediates for esters and polyglycol derivatives are very satisfactory. With silicones and fluorocarbons, the expense is due to the process of manufacture and not to the cost of the raw materials.

Similar oils are being made for automotive use, diesel oils, gasoline engine oils, etc.

G. H. G.

1620. Patents. Ger.P. 871,242, 19.2.53. W. Kliebisch, assr to Siemens & Halske A.G. Berlin and Munich. Lub for mobile structural parts, *e.g.*, revolving shafts for structural elements in the adjusting technique (switches, adjustable resistances, condensers, etc.)

Ger.P. 872,623, 19.2.53. H. Engel, assr to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. " in dissolution "), Ludwigshafen (Rhein). High pressure lub. (*BrennstChemie*, 1953, **34** (5–6). R. T.

Bitumen, Asphalt, and Tar

1621. Patents. Ger.P. DIN 4109, March 1952. Soundproofing in buildings above ground. Construction of cast asphalt floating floors.

Ger.P. 754,071, 20.10.52. H. Schlumberger and W. & J. Kessler, assrs to Kohle- & Eisenforschung G.m.b.H., Düsseldorf & Gelsenkirchener Bergwerks-A.G, Essen. Production of tar-pitch masses by softening hard pitch. Hard pitches E.P. 100°, better 130° K.-S., containing free C >45%, sp 55%, fluxed with coal tar dist for adhesiveness and toughness over wide temp range.

Ger.P. 757,293, 8.11.51. W. Mühlendyck, W. Weiss, and F. Eisenstecken, Dortmund, assrs to Kohle- & Eisenforschung G.m.b.H., Düsseldorf. Plastic masses for corrosion protection produced by adding coal tar pitch with 3 to 8% polyvinyl compounds to anthracene oil and/or coal tar, and heating 10 hr to 150° to 200° C. Reaction liq and low boiling portion drawn off after heating.

Ger.P. 829,496, 28.1.52. Assr unknown. K. H. Hauerwaas, Bamberg. Plastic masses comprising binders for threads and fillers: aq emulsions of bitumen, synthetic resin, *e.g.*, vinylacetate resin and a wetting agent: Turkey-red oil, higher-mol aliphatic or aromatic sulphone—or sulphocarboxylic acids of naphthalene, naphthols and naphthylamine, saponin, etc., used with a vegetable or mineral powder.

Bitumen, Teere, Asphalte, Peche, 1953, **4** (1). R. T.

Special Hydrocarbon Products

1622. Styrene. P. W. Sherwood. *Petrol. Process.*, 1953, **8** (5), 724–8.—At present there are 4 companies in the U.S. engaged in the production of this important monomer

from petroleum. Two manufacturing processes, fundamentally different, are employed for the commercial synthesis of styrene. The first consists of the ethylation of benzene to ethyl-benzene and the dehydrogenation of this intermediate to styrene. The second method is more involved. From the ethylbenzene stage, oxidn takes place to acetophenone, this in turn is hydrogenated to methyl phenyl carbinol, and hence to styrene by dehydration. The first stage to ethylbenzene, is carried out in the liq phase in the presence of aluminium chloride.

The operating conditions of both methods are discussed, and the details of the vapour phase ethylation process are given, together with an outline of the purification methods used for ethylbenzene. J. W. H.

1623. Patents. Ger.P. 871,749, 12.2.53. H. J. Pistor, assr to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. (" in dissolution "). Method for producing org compounds containing oxygen.

Ger.P. 871,750, 12.2.53. W. Wenzel and A. Gemassmer, assrs to Chemische Verwertungsges, Oberhausen m.b.H., Oberhausen-Holten. Method for producing org compounds containing oxygen.

Ger.P. 871,442, 12.2.53. W. Berndt, assr to Farbwerke Höchst, formerly Meister Lucius & Brüning, Frankfurt (Main)-Hochst. Method for producing 2-ethyl-hexane diol-(1 : 3).

Ger.P. 871,889, 19.2.53. R. Klemm, assr to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. " in dissolution "), Ludwigshafen (Rhein). Method for producing org compounds containing oxygen.
(*BrennstChemie* 1953, **34** (5–6). R. T.

Derived Chemical Products

1624. Contemporary aspects of petrochemistry. A. Aftalion. *Chim. et Industr.*, 1953, **69**, 833–41.—Main petrochemical reactions are outlined, and charts are given showing products derivable from light paraffins, ethylene, propylene, butylene, and aromatics. V. B.

1625. Synthetic organic chemicals in 1975. Anon. *Petrol. Refin.*, 1953, **32** (5), 93–6.—A tabular presentation of the data in the U.S. Materials Policy Commission's report estimating production of the main synthetic organic chemicals in 1955 and 1975. R. D. S.

1626. New 1953 petrochemical directory. Anon. *Petrol. Process.*, 1953, **8** (5), 713–22.—Of the 143 companies engaged in the U.S. and Canada in the manufacture of petrochemicals, 58 are petroleum companies or their subsidiaries, 79 are chemical companies, and 6 are joint ventures between petroleum and chemical firms. These companies have between them a total of 271 plants, either in operation, under construction, or planned, 26 of them having been put into operation in the past 12 months.

A comprehensive list of the above companies is set out in tabular form, giving company names and managers, plant location, hydrocarbon raw materials, and petrochemical products. J. W. H.

1627. Petroleum chemical industry in Great Britain. Anon. *Nature, Lond.*, 1953, **171**, 679–81.—Summary of a symposium " Production and Utilization of Petroleum Raw Materials in the U.K. Chemical Industry " held in London on 2 March 1953. 12 papers were presented.

Two papers on the economics of the industry were followed by one on the technical basis of the industry, in which the raw materials are described and classified. Two papers considered plant design and construction, with emphasis on the suitability of constructional materials.

Among the chemical processes discussed were : the recovery of light olefins from refinery and cracker gases ; the synthesis of ethyl alcohol by cat hydration of C_2H_4 ; the cat oxidn of C_2H_4 to C_2H_4O over a silver cat ; and alkylation of aromatics, followed by oxidn to the hydroperoxide and its decomposition to a phenol and a ketone (*e.g.*, the conversion of benzene and propylene to phenol and acetone).

Polymer production was discussed in papers on polystyrene and polythene. The conversion of butane to butene for making *iso*-octane, and the separation and utilization of butenes from refineries and from pet chemicals plants were discussed. A paper was given on the use of those additives based on pet for improving the quality of pet fractions, viz., chlorinated waxes, naphthenic acids, V.I. improvers, pour-point depressants, etc.

The work of the symposium was summarized by Sir Robert Robinson in a closing address. H. C. E.

1628. Correlating ethane pyrolysis data. R. A. Carpenter and F. C. Fowler. *Petrol. Refin.*, 1953, **32** (4), 153–4.—New data presented here suggest that the conversion of ethane to ethylene is not a first order reaction as previously supposed, and graphical correlation of this and other data enables calculation of the reaction conversion for any temp–contact time combination up to a max of 60% conversion, above which substantial side reactions occur. R. D. S.

1629. What acetylene costs via the Wulff process. T. Weaver. *Petrol. Refin.*, 1953, **32** (5), 151–6.—A description of the Wulff process for the production of acetylene by the pyrolysis of natural gas, ethane, or propane. Basic information needed to determine the production cost is given, and an economic comparison made with the carbide process, the result depending upon the availability of carbide on the site. R. D. S.

1630. Phthalic acids—petrochemicals of the future. Pt. 2. Commercial operations. P. W. Sherwood. *Petrol. Refin.*, 1953, **32** (4), 155–8.—Describes fluidized-bed operation and gives details of fixed-bed operation for the partial oxidn of naphthalene to phthalic anhydride. The purification processes are also described. The separation of *p*-xylene from mixtures with *m*-xylene and ethyl benzene, and its oxidn to terephthalic acid, are also discussed. R. D. S.

1631. Understanding the chemistry of petrochemical reactions. Pt. I. Petroleum as a raw material for the chemical industry. L. F. Hatch. *Petrol. Refin.*, 1953, **32** (5), 143–5.—A summary of the composition of crudes in terms of hydrocarbons, the separation of these, and their basic reactions. R. D. S.

1632. A study of a petrochemical plant. P. Gustavson. *Kemija u Industriji*, **2** (1), 1–4.—There exist in Yugoslavia all conditions and possibilities for erection of a petrochemical plant. The author discusses the necessity of such a plant, gives a detailed analysis of the raw material basis available in the country, proposes the most suitable technological process, and gives finally a survey of the material balance, the power requirements, and the productiveness of such a plant. (Author's Summary.)

Coal, Shale, and Peat

1633. Fluid-borne solid particles with particular reference to solid fuel for internal combustion engines. J. S. Moloney. *Engng J., Montreal*, Apr. 1953, **36**, 395–401.—The results are reported of work carried out on the flow of solid particles of coal in air with a view to further improvements in the design of i.c. engines and the use of pulverized coal. The relation between the velocity of a coal particle in still air and the resulting frictional resistance force has been determined for several different particle sizes. The data indicate some of the factors to be considered in engine design and operation. A comparison is made between values of drag coeff for coal particles moving in air, and those for spheres at the same values of Reynolds numbers. W. H. C.

1634. Recovery of coal by-products from coke oven gas. F. Rosendahl. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (1), 18–21.—In Pt 2 procedures and economics are discussed for ammonia—as sulphate or calcium ammonium nitrate—urea, and ammonium bicarbonate recovery. R. T.

1635. Fuels in the Soviet Union. G. Sarukhanian. *Erdöl u. Kohle*, 1953, **6**, 207–9.—Coal reserves (1952) are estimated at $1{\cdot}65 \times 10^{12}$ tons. Analyses of numerous Russian coals, shales, and peat are tabulated, and specifications for diesel fuels and gasolines given. V. B.

Miscellaneous Products

1636. Insecticide names. C. C. McDonnell. *Soap, N.Y.*, Jan. 1953, **29** (1), 27.—Synthetic insecticides are listed. Chemical names, trade names, and names approved for labels under Federal Insecticide, Fungicide, and Rodenticide Act are given. M. V. J.

1637. New bacteriostat for soap. R. S. Shumard, D. J. Beaver, and M. C. Hunter. *Soap, N.Y.*, Jan. 1953, **29** (1), 34.—An evaluation of Actamer (2 : 2′-thiobis (4 : 6-dichlorophenol) as an ingredient of medicated soap is presented.

Properties, including solubility in water (poor, but increased by addition of alkali) and organic solvents, v.p., and ionization constants, are given. Stability in storage good. *In vitro* tests showed Actamer to be effective against gram-positive and some gram-negative bacteria. Activity against some pathogenic fungi was shown. Hand-washing tests showed that 2% Actamer in bar soap reduced the resident skin flora by 97·4% after 12 days. Data on acute oral toxicity, cumulative oral toxicity, and skin irritation effects are presented. 17 refs. M. V. J.

1638. Evaluation of dishwashing detergents. Pt II. J. C. Harris. *Soap, N.Y.*, Jan. 1953, **29** (1), 42.—Pt II completes the study of dishwashing detergent evaluation as described in 17 selected papers. The various soiling compositions used are set out in tabular form. General conclusions are presented, namely : 5 general methods are used for estimating soil removal, 8 different methods for application of soil to test surface, 7 different types of washing machine, and as many as 15 different soiling media. 18 refs. M. V. J.

1639. Urea–formaldehyde resin as a vehicle for semi-permanent marine anti-fouling coatings. P. Bracey. *J. Oil Col. Chem. Ass.*, June 1953, **36** (396), 322.—Trials were carried out at Burnham-on-Crouch on the use of lacquers of urea–formaldehyde resin containing DDT to prevent fouling by barnacles. These lacquers have proved successful over a period of 2 years on wood surfaces. γ-BHC and dieldrin were found not to prevent barnacle attack. During 1951 further trials with DDT containing lacquers were made at Southampton Harbour, which confirmed the results obtained at Burnham.

At present experiments are being conducted at Burnham-on-Crouch, Southampton Harbour, and Port of London with lacquers containing DNOC, organic mercury compounds, and other materials to prevent fouling by algæ on ships and harbour works. In Southampton Harbour urea resin lacquers are being tested for preventing attacks by gribble and teredo. D. K.

1640. Montan wax—its place and that of its derivatives in the floor wax industry. C. J. Marsel. *Soap, N.Y.*, Jan. 1953, **29** (1), 120.—The Montan wax industry in Germany and the U.S.A. is surveyed. Extraction and processing in Germany have been developed to a high level, resulting in production of useful and versatile waxes. Gersthofen K.P.S. wax is remarkably similar to carnauba wax, and can therefore be formulated in the same way, with the added advantage of greater uniformity of different batches. The composition and preparation of emulsion floor polishes using K.P.S. wax are described. Similar data are given for use of other Gersthofen waxes in paste and solvent based liq polishes. The author concludes that U.S. wax cannot at the present time compete with the German product. 8 refs. M. V. J.

1641. Epoxide resins. R. N. Wheeler. *J. Oil Col. Chem. Ass.*, June 1953, **36** (396), 305.—A brief description of epoxide resins is given, including a table of physical and chemical properties of " Epikote " resins. The article deals, in the main, with the use of epoxide resins in surface coating applications. Methods of using these resins in surface coatings can be considered under the following headings : (*a*) esterification, including the use of esters alone in oil drying or stoving finishes and with amino resins

in stoving finishes; (*b*) epoxide resins cross-linked with phenolic or amino resins in stoving finishes; (*c*) epoxide resins cross-linked with amines in room temp cured and stoved finishes. The properties and applications of the resultant coatings are discussed. Other applications of epoxide resins noted are their use in glass fibre laminates, in the potting of electrical components, as stabilizers for chlorinated compounds, and as metal-to-metal adhesives. D. K.

1642. Application of cresolic extract as raw material in paint and varnish industry. S. Gibinski. *Bull. (Polish) Inst. Petrol.* (Supplement to *Nafta (Krakow)* 1952, **8**), 1952 **(2)**, 9.—Cresolic extract can be used as a substitute for linseed oil where the latter is not the main component of the varnish. M. S.

Corrosion

1643. Evidence of corrosion failures in drill stem members. A. P. Farr. *Corrosion*, 1953, **9** (4), 108–11.—Fractures occurring in drill stems are due to corrosion fatigue caused by cyclic stresses in the presence of corrosive drilling mud. Fatigue fractures are possible without corrosion, but the process is greatly accelerated when corrosion is present. Examples of failures are given. K. G. B.

1644. Drill stem corrosion in West Texas. S. C. Moore. *Corrosion*, 1953, **9** (4), 112–14.—When wells were drilled with a circulating fluid containing ½ to 5% salt, drill pipe failures owing to corrosion fatigue were widespread. Costly failures originating on the inside of drill collar joints were avoided by incorporating a ring of magnesium in the drill collar box. More recently, saturated salt water mud has been used, reducing the life of the magnesium to a few days, but rings of 61S aluminium alloy appear to be more satisfactory. K. G. B.

1645. Some corrosion problems encountered in Mina-al-Ahmadi refinery. V. J. Chir, F. H. Colenutt, and K. Turner. *Inst. Petrol. Rev.*, 1953, **7** (77), 159.—Corrosion problems encountered in the Kuwait refinery are of two types: (1) those due to actual processing of the crude; (2) those due to the use of seawater for cooling purposes. The plant is a single-stage atmospheric crude oil dist unit of 25,000 b.s.d. capacity, and its main purpose is to provide fuel for tankers loading crude oil at Mina. Kuwait crude is low in H_2O content, but nevertheless, in accordance with the current practice, caustic soda is injected into the fuel. Substantial corrosion has been found, presumably due to the abrasive action of small pellets of caustic soda. It was eventually overcome by adjustment of quantities. Seawater corrosion was combated by the introduction of magnesium blocks. R. H.

1646. Test cooling water for corrosion by these methods. M. C. Forbes. *Petrol. Refin.*, 1953, **32** (4), 130–3.—The corrosive properties of cooling water may be classified roughly by weight loss tests on nipples or washers inserted in the water lines as described here. Some laboratory tests are also described, and a discussion of the results given. R. D. S.

1647. Preventing hydrogen attack on steel—Pt. I. W. A. Bonner *et al.* *Petrol. Process.*, 1953, **8** (5), 686–90.—The extent of atomic hydrogen attack on steel equipment in refineries has been increased by the use of modern refining processes and the more extensive use of sour hydrocarbons. The atomic hydrogen causing the damage is released by acid corrosion of the steel. When streams containing ammonia and hydrogen sulphide at a pH of 7 to 9 are processed, considerable damage occurs through blistering and fissuring.

Practical methods for the detection of hydrogen penetration are given, together with the conditions necessary for the attack to occur. New techniques for its prevention by the use of ammonium polysulphide and oxygen as inhibitors are described. J. W. H.

1648. Hydrogen blistering of steel in hydrogen sulphide solutions. T. Skei, A. Wachter, W. A. Bonner, and H. D. Burnham. *Corrosion*, 1953, **9** (5), 163–72.—Hydrogen blistering encountered in refineries, especially in cat cracker gas plants, has

been investigated in the laboratory by measuring the vol of hydrogen diffusing through a thin wall of carbon steel. The atomic hydrogen necessary for diffusion is produced by chemical reactions on the steel surface. With a hydrogen sulphide soln the reaction may be self-stifling, owing to the formation of a protective sulphide scale, but in alkaline soln containing sulphide and cyanide the scale is removed as a ferrocyanide, allowing continuous production of hydrogen and diffusion into the steel. Oxygen may act as a promoter or an inhibitor of hydrogen blistering, depending on the environment. Preventive measures aim at reducing the corrosion reactions by adjustment of pH, use of corrosion inhibitors, or water washing. K. G. B.

1649. Scale *vs* bare steel potential differences may explain unusual tank vessel corrosion. L. M. Mosher. *Corrosion*, 1953, **9** (5), 1–2.—Heavy pitting of heater coils and structural members in the lower parts of cargo tanks of crude oil tankers is believed to be due to galvanic corrosion between scale and steel exposed at breaks in the scale. It is found on those parts subject to vigorous cleaning, and occurs whilst the tanks are in seawater ballast. K. G. B.

1650. Value of test coupons in cathodic protection. M. E. Parker. *Oil Gas J.*, 11.5.53, **52** (1), 126.—Use of test coupons to tell whether full protection is being afforded and to measure current density at a given location is discussed. G. A. C.

1651. The elements of cathodic protection. K. A. Spencer. *Inst. Petrol. Rev.*, 1953, **7** (77), 149.—The cost of replacing corroded buried pipeline, in the U.K., is understood to be about £5 million annually, despite all the various types of protection that have been used over the years. The protection coating technique has been developed over the last 20 years, but permanent protection can still not be obtained at an economic cost. However, supplemented by cathodic protection at points of failure, effective protection can be obtained at a reasonable cost. Corrosion is caused by contact with soluble salt, water, and oxygen in the soil, resulting in different electrode potentials. Hence, solution of the metal takes place. The theory of cathodic protection is that the natural anode of the structure is replaced by an expendable external anode which is replaced periodically. Metals such as magnesium, aluminium, or zinc, which have higher electrode potentials than iron, are used. The method of application, the equipment employed, and the economies of the process are all discussed. R. H.

1652. Corrosion control. M. E. Parker. *Oil Gas J.*, 11.5.53, **52** (1), 143.—A permanent installation for monitoring a pipeline cathodic-protection system is described. Location and accessibility of the monitoring points are discussed. G. A. C.

1653. Mitigating corrosion in processing equipment. G. L. Farrar. *Oil Gas J.*, 4.5.53, **51** (52), 101.—This is a résumé compiled from technical papers, informal discussions, and symposia presented at the recent annual meeting of National Association of Corrosion Engineers in Chicago.

Inspection programmes, observed corrosion rates, hydrogen sulphide corrosion, naphthenic acid corrosion, corrosion in gasoline tanks, and cathodic protection of heat-transfer equipment are among subjects dealt with. G. A. C.

1654. A method for determining the resistance of insulating joints and pipe line coatings. H. F. Koester. *Corrosion*, 1953, **9** (5), 159–62.—The resistances are calculated from the results of measurements made using connexions to the pipe on either side of each insulating joint. The method of calculation is given in detail. K. G. B.

1655. A laboratory method for screening oil well corrosion inhibitors. J. A. Caldwell and M. L. Lytle. *Corrosion*, 1953, **9** (5), 186–7.—A mild steel test coupon is sealed into a glass tube with a mixture of brine and oil in an atmosphere of natural gas and hydrogen sulphide. Care is taken to eliminate air. The tube is mounted radially on a wheel rotated at 30 r.p.m., and corrosion is assessed by weight change of the specimen after 14 days. The results are correlated with field tests. K. G. B.

1656. Galvanic corrosion—5. Anon. *Oil Gas J.*, 1.6.53, **52** (4), 115.—This part of the series deals with equipment for conducting a corrosion survey, and figures show field use of a copper sulphate half-cell, an earth current meter, and a cantilever electrode. G. A. C.

Engines and Automotive Equipment

1657. Napier Nomad diesel–gas turbine set. Anon. *Gas Oil Pwr*, 1953, **48**, 85–6, 88.—This aircraft engine consists of a port-scavenged 2-stroke engine exhausting into 2 co-axial gas turbines (*cf.* Abs. 816, 1952). In its present form it has been somewhat simplified, and its length and weight have been reduced. It possesses the following advantages: (1) fuel consumption 0·33 to 0·35 lb/e.h.p. hr; (2) equal efficiency when operating on kerosine, diesel fuel, or gasoline; (3) comparative insensitivity to atmospheric temp; weight 3580 lb for 3235 e.h.p.

Expressed as a percentage of direct cost of aircraft operation, the fuel costs of various types are: jet, 35; propeller turbine, 28; Nomad (gasoline), 22; Nomad (diesel fuel), 18. All the components of the unit are of normal construction, except for the gearing which couples the turbine with the engine camshaft. H. C. E.

1658. Four diesel locomotives for Sudan. Anon. *Gas Oil Pwr*, 1953, **48**, 94.—These locomotives are powered by McLaren 6-cyl M6 4-stroke engines with a sea-level rating of 132 b.h.p. at 1000 r.p.m. The main engine is started by a Morris industrial petrol engine through a Bendix gear, and the drive is taken through a 4-speed gear box. The exhaust is passed through a water box to remove the risk of escaping sparks. The locomotives have 8 wheels of dia 26 inches, and weigh 16¾ tons in working order. H. C. E.

1659. Novel diesel waste heat installation. Anon. *Gas Oil Pwr*, 1953, **48**, 81–4.—A power house containing 6 AEC engines of cyl bore 4·72 inches and stroke 5·59 inches, rated at 100 b.h.p. at 1500 r.p.m., and coupled to GEC 3-phase alternators, has been equipped to recover the waste heat for space heating. Under normal conditions 4 engines operate for 9½ hr/day, and the primary cooling water and lub oil both pass through heat exchangers. The secondary cooling water passes to a contraflow exhaust gas boiler, and is heated to 186° F. The return water is at 154° F, and 300,000 B.Th.U/hr/engine are used for heating purposes.

Devices are incorporated which ensure rapid heating of the primary water when the engines are started; this reduces the possibility of corrosion in the boiler due to condensation of exhaust gases. If overheating occurs a pump automatically circulates the secondary water through another heat exchanger on an independent circuit. H. C. E.

1660. New diesel for International Harvester tractors. Anon. *Gas Oil Pwr*, 1953, **48**, 11.—This unit has 4 cyl of bore 4 inches and stroke 5¼ inches. Operating at 1450 r.p.m., it develops 38·2 belt h.p. and 34·3 drawbar h.p. Precombusion takes place in an antechamber, and the fuel injection system comprises a CAV pump with 4 8-mm plungers and a centrifugal governor.

The pistons have 3 compression and one oil control rings, and a shallow recess in the piston heads. Lubrication is by a gear pump driven from the camshaft, and pressure lubrication is supplied to all bearings. H. C. E.

1661. Powerful mines diesel locomotive. Anon. *Gas Oil Pwr*, 1953, **48**, 114.—This locomotive is powered by a Cummins NHHB1-600 horizontal engine with 6 cyl of dimensions 5½-inch bore and 6-inch stroke, giving an output of 170 b.h.p. at 2100 r.p.m. The engine weighs 2300 lb, and its dimensions are 64 by 55 by 23 inches.

The usual auxiliary equipment is fitted, and there are various safety devices. The exhaust gases pass through a trap, and warning is given if the exhaust temp exceeds a certain level. The exhaust manifold is watercooled, and water is sprayed into the exhaust stream. The air supply can be shut off to prevent the engine running solely on methane in a gassy mine, and a warning system is provided in the case of the flame traps on the inlet side becoming choked.

Mechanical transmission takes the drive through a clutch and four-speed gearbox to the wheels, giving speeds of 5½, 7, 9½, and 14 m.p.h., with tractive efforts of 11,000, 7500, 5700, and 3850 lb. Running on a 3½-ft gauge, the locomotive is 7 ft wide and only 39 inches high. H. C. E.

1662. Gas turbines of the future. W. E. P. Johnson. *Gas Oil Pwr*, 1953, **48**, 104.—The development of the gas turbine as a source of power in steelworks, coalmines, and power generation, and as a prime mover for shipping, railways, and road transport is summarized. H. C. E.

1663. Vee-form Supairthermal [diesel] engine. Anon. *Gas Oil Pwr*, 1953, **48**, 111–13, 129.—These 12- and 16-cyl units have cyl of bore and stroke 13 and 16½ inches, and develop 3200 and 4260 b.h.p. respectively at 600 r.p.m.

The engine construction is detailed. For fuel oil operation, a constant-stroke injection pump is mounted on each cyl, and a multi-hole injector is used. For dual fuel and spark ignition, a hydraulically operated gas valve is mounted in the cyl head, and two-spark plugs are used to ensure complete combustion. Rotary oil pumps supply oil under pressure to an oil header, and thence through drilled passages to the cast-iron pistons and to the moving parts.

The pressure-charging arrangements are on the Miller principle (*cf* Abs. 324, 1952), which combines a constant pressure exhaust system with means for cooling the intake air. H. C. E.

1664. Air-cooled S.L.M. design [of diesel engine]. Anon. *Gas Oil Pwr*, 1953, **48**, 108.—This range of engines comprises vertical units with from 1 to 6 cyl, horizontal units with 4 or 6 cyl, and horizontally opposed or Vee-form units with 8 or 12 cyl. Intended for transport, marine use, and small power generators, they cover a range from 10 to 250 b.h.p.

The cyl bore and stroke are 110 mm and 140 mm respectively; for stationary and marine use, the max output is 10 to 14 b.h.p/cyl at 1800 r.p.m.; for transport, it is 20 b.h.p/cyl at 2200 r.p.m. An axial blower driven from the crankshaft supplies combustion and cooling air. H. C. E.

1665. Harland and Wolff sets for B.E.A. at Blackpool. Anon. *Gas Oil Pwr*, 1953, **48**, 97.—5 diesel alternator sets are to be installed at Blackpool power station. Each set has an output of 1280 kW at 333 r.p.m., and comprises an 8-cyl 4-stroke 840SB pressure-charged engine directly coupled to a 3-phase alternator supplying current at 6600 V. The engines have cyl of 400 mm bore and 600 mm stroke, with 2 inlet and 2 exhaust valves per cyl. The pistons are oil cooled, and the engines operate on the dry sump principle. H. C. E.

1666. New high speed Perkins automotive engine. Anon. *Gas Oil Pwr*, 1953, **48**, 98.—The R6 engine has 6 cyl of 4 inch bore and 4½ inch stroke, and operates at 2700 r.p.m. with an output of 108 b.h.p. and b.m.e.p. 93 p.s.i. The max torque is 240 lb-ft at 1500 r.p.m. Details of the engine construction are given.

The Al-alloy pistons have 3 compression and 2 scraper rings, and the cyl head carries the injector, valve gear, and tappets. The Aeroflow combustion system is used, and it is claimed that it will operate efficiently from the lowest speeds up to 4000 r.p.m. A gear pump driven from the crankshaft feeds lub oil to the main gallery through a full flow filter. Cooling water is circulated at about 30 g.p.m. at the max engine speed. H. C. E.

1667. Turbulent combustion and combustion phases in an engine. K. I. Shchelkin. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1953, 463–71. **Effect of physical factors on the rate of flame propagation in engine conditions.** L. S. Kozachenko. *ibid.*, 472–9. **Effect of chemical and turbulence factors on combustion in a spark-ignition piston engine.** K. I. Genkin. *ibid.*, 480–5.—These 3 papers are contributions to the discussion on the paper covered by Abs. 888, 1950.

Separation of the combustion process into phases, as suggested by the original authors, is generally supported on theoretical grounds. Further deductions are made from the experimental results given, and it is considered that the normal rate of flame propagation is less dependent on pressure than was stated by Sokolik *et al*. Additional consideration should have been given in the original paper to effects due to change of mass and pressure in the charge during combustion. V. B.

1668. Fuel ash deposits in open cycle gas turbines. A. T. Bowden, P. Draper, and H. Rowling. *Gas Oil Pwr*, 1953, **48**, 109–10, 129.—The economic fuel for gas turbines, heavy oil, contains *ca* 1% ash, which comprises mainly sodium and vanadium, with lesser amounts of other metals, and some S.

Tests were made on a Parsons Experimental gas turbine (inlet temp 565° C) with gas oil to which oil sol salts of various metals were added. It appears that ash deposition on the turbine blades depends on whether any constituent of the ash is semi-molten at the temp of the blade. Rig tests failed to yield appreciable deposits, and this was attributed to the presence in the exhaust gas of hard C particles, 1 to 50μ dia, which abraded deposits from the blades. Deposition could be reduced in the experimental unit by altering the fuel atomization arrangements so that a coarser oil spray was obtained, and C particles of the requisite size were formed and abraded the deposits.

Deposition was also reduced by the use of oil additives containing oil-sol salts of Si, Zn, and Mg.

This paper was read to the Institution of Mechanical Engineers in London, and the ensuing discussion is also reported. H. C. E.

1669. Sirron pressure-charged two-stroke [diesel] units. Anon. *Gas Oil Pwr*, 1953, **48**, 116.—This loop-scavenging marine engine operates on the 2-stroke cycle with turbo-pressure-charging. It has 6 cyl of dimensions 240 mm bore and 345 mm stroke, and, with normal pump scavenging, its output is 300 b.h.p. at 330 r.p.m., giving a b.m.e.p. of 63 p.s.i. With turbo-charging the b.m.e.p. is increased to 100 to 110 p.s.i. H. C. E.

1670. Engines in petroleum industry. J. Wojnar. *Nafta* (*Krakow*), 1952, **8**, 196–8, 224–5 (*Petroleum News Supplement*).—Comparative essay on steam, I.C. engines, and electric motors. M. S.

Safety Precautions

1671. Explosion-proof equipment is here to stay. R. P. Northup. *Petrol. Refin.*, 1953, **32** (5), 123–6.—The paper reviews the essential facts in the design and application of explosion-proof equipment, including its installation and maintenance. R. D. S.

Miscellaneous

1672. World petroleum supplies. Facts, figures, problems. H. Köhn. *Erdöl u. Kohle*, 1953, **6**, 168–72.—Review. W. Germany obtains 3½% of energy requirements from pet, as against 37% for world. Proven world reserves are 26 times 1952 consumption. Ratio reserves : annual production is : Middle East, 80; U.S.A., 13; Germany, 20. Consumption trends and effect of European refining are discussed. Annual *per capita* pet consumption (kg) is : W. Germany, 90; U.K., 324; Sweden, 620 (highest in Europe); U.S.A., 1943. Currency aspects of W. German oil imports are briefly considered. Average overall investment per ton increased pet capacity is $80, a comparable figure for German coal industry being $40 to $50. V. B.

1673. Analogy computers in the petroleum industry. A. Cornu. *Bull. Ass. franç. Tech. Pétrole*, 1953, **99**, 25–46.—Analogy computers differ from arithmetic calculators in that data is transformed into physical characteristics (usually electric currents) that can be continuously varied. Elaborate programming is unnecessary, although scope is more restricted. Principles of operation are described, with circuit diagrams and corresponding equations. Applications to pet industry in calculations of spectral analysis (infra-red and mass), dist and phase equilibrium, and drilling problems are illustrated. V. B.

1674. Automatic computers save money and technical manpower. W. M. Harp. *Petrol. Refin.*, 1953, **32** (4), 159–61.—An outline of the capabilities of these machines is given, and their use for repetitive calculations, such as plate-to-plate problems and mass-spectrometer analyses, described. R. D. S.

1675. Optics in petroleum processing. P. D. Foote. *Petrol. Process.*, 1953, **8** (5), 694–9.—This paper reviews the uses of infra-red, ultra-violet, emission spectroscopy, and X-ray fluorescence, and other related optical devices in the petroleum industry.

Emission spectroscopy is particularly useful in the examination of cat to determine if it meets specification. Infra-red technique can reduce the time required in the identification of an isomeric compound by one-seventh. The most fundamental and important application of optics is in the calculation of thermodynamic functions from spectroscopic data. J. W. H.

1676. The influence of certain smokes and dusts on the SO_3 content of the flue gases in power-station boilers. P. F. Corbett and D. Flint. *J. Inst. Fuel*, May 1953, **25** (149), 410.—Results of tests carried out indicate that in the presence of certain smokes and dusts the SO_3 content of flue gas is reduced or its corrosive effects are minimized. In the preliminary tests the BCURA dew-point meter was used alone, later a direct chemical method of analysis and a corrosion probe were employed. In the preliminary tests with zinc oxide smoke, SO_3 was removed or its formation inhibited.

In the second series of experiments, dust collected from the electrostatic precipitators of a pulverized-fuel fired boiler was used, and the last series of tests was carried out on two boilers fitted with auxiliary pulverized-fuel burners. Results of these experiments showed that auxiliary pulverized fuel firing materially diminished the corrosive nature of flue gases. The mechanism of the action of dusts on flue gases is discussed. D. K.

1677. Construction and operation of Royalite's sulphur recovery plant. D. D. Dunbar. *Engng J., Montreal*, Apr. 1953, **36**, 378–83.—Designed by the Foster Wheeler Corpn, this plant for the recovery of sulphur from Turner Valley natural gas was started-up in July 1952. This paper describes the many problems concerning construction and operation and discusses the main chemical and physical aspects of a sulphur recovery unit. Important operational and safety features are described. Brief details are given of the processes involved and separation of the products and their marketing. A flow sheet is shown. W. H. C.

1678. Personnel management a major problem. A. L. Foster. *Petrol. Engr*, March 1953, **25** (3), C41–2. A new trend in oil company management is the increased attention given to problems connected with personnel management, training, and selection. The employee's training takes place in four separate steps: (1) preparation of the learner, carried out in a conference or discussion group; (2) demonstration of the operation under study; (3) trying out the job, in which the student takes the lead; (4) student "take-over." Participation in activities by supervisors and employees has proved to be the best means of obtaining co-operation. G. H. G.

1679. Automatic drum filler cuts costs. B. MacDonald. *Petrol. Engr*, March 1953, **25** (3), C33.—The aims of automatic drum filling are: (1) elimination of the operator during entire filling cycle; (2) reduction in length of filling cycle. The difficulties are the varying height and dia of drums, and foaming with lub oils. A two-station machine was designed, the first station locating the bung, and the second being the filling scale, the filling rate being 225 g.p.m. The control circuit is predominantly hydraulic, with a system of "safe failing" interlocks to prevent oil spillage or machine damage when there is no supply of power or drums.

In practice, the downtime for mechanical reasons is about 1%. So far the machine has been used exclusively for lub oils, but future uses are given. G. H. G.

1680. Mineral wool blocks spaced on ducts for efficient, dependable service. Anon. *Petrol. Engr*, Feb. 1953, **25** (2), C48–9.—Spaced application of duct insulation is one of the most versatile, dependable, and efficient methods for insulating high temp gas and air ducts in central generating stations and industrial power plants. The basic materials used are: (1) 6 by 6-inch road mesh; (2) mineral wool block insulation; (3) corrugated steel bands; (4) special punched steel clips. The installation and application are described. G. H. G.

BOOK REVIEWS

Field Geology. New 5th Edition. Frederic H. Lahee. New York: McGraw-Hill Book Co. Inc., 1952. Pp. xxx + 883. $8.50.

This clearly printed and profusely illustrated volume is a revised edition of a well-known text-book. Its title very inadequately portrays the contents of a work which has deservedly achieved popularity; for the descriptive matter is written in an easy, lucid, and entertaining style, in language not unmixed with commonplace jargon that inspires interest and engrosses attention. Within the scope of 26 chapters, almost every aspect of field geology is comprehensively discussed, and all paragraphs are suitably headed and annotated to render references readily accessible. Its value is materially enhanced by the detailed contents list, clearly explaining the context of the 564 paragraphs into which the book is divided. Other noteworthy features are the 27 pages of index and the extensive bibliography, so helpful to those seeking information on specific subjects. In a short preface to the new edition, emphasis is placed on the need for revision on account of the momentous and incessant advances made in all branches of science, following developments in instruments and technique designed to aid surface and sub-surface geology. Aero-photography has considerably facilitated and hastened reconnaissance surveys in rugged country, and geophysics and electronics have revolutionized sub-surface investigations.

A striking feature of the book, distinct from the assemblage of a vast amount of valuable data, is the method of presentation, for the writing throughout displays a notable absence of rhetoric and an avoidance of theoretical concepts. The sensible and practical co-ordination of factual material cannot do otherwise than appeal to field workers and those engaged in mining and such-like pursuits. It is impossible to compress within the space of a short preview more than passing reference to the manifold subjects treated, most of which are illustrated by appropriate sketches, photographs, or line drawings. Particularly commendable is the precise rendering of definitions introduced into the modern geological vocabulary to designate special features of rocks related to origin or environment.

The first few chapters deal essentially with the physical, lithological, and stratigraphical characteristics of fragmentary sediments and the deposition and malformation of sedimentary beds under an infinite variety of conditions. Chapter 6 deals with the many types of igneous rocks and their classification, composition, and physical properties, according to their method of extrusion, expulsion, or flowage. The many patterns eruptive rocks assume, and their influence on the beds with which they make contact, are detailed. The contents of Chapters 7 and 8 relate to the deformation, faulting, or fracturing of rocks and their surface expression. The forces operating in the development of flowage, tilts, folds, faults, joint cracks, etc, are described, together with remarks on brecciation, slickensiding, cleavage, and other phenomena associated with drag and compression. The importance of isostatic settlement of beds, and the effects of differential compaction of compressible sediments on an uneven basement or interbedded layer are stressed.

Arising out of such considerations, there follows a description of salt domes, where it is observed that no distinction has been drawn between true domes with quaquaversal flanks and the elongated salt extrusions or plugs without cap rock that have pierced definite lines of rupture, giving to the strata on the two edges an upturned and attenuated form that favours the concentration and retention of oil in transgressing sands. Specific reference might have been made to what has become known as sedimentary vulcanism and the bulging, or extrusion, of plastic clays, as the result of lateral compression where the overburden in valleys has proved inadequate to restrain upheaval or piercement. Fossil mud volcanoes associated with petroliferous non-indurated clays have been distinguished in many oilfield regions, where at times, as in Russia, Trinidad, Barbados, and Brunei, they assume amazing proportions. Drilling operations in beds of Tertiary or post-Tertiary strata have disclosed many disconcerting anomalies when exploring for oil in faulted anticlines. Such alteration products as laterite and bauxite would appear to warrant some discussion on their mode of formation.

Under the title of "Topographic Forms and Expressions" appears a compre-

hensive digression on such subjects as the formation of slopes, cliffs, beaches, terraces, plains, swamps, hanging valleys, caves, ridges, and associated erosional factors. Topographical and geological mapping and the preparation of profile sections is exhaustively treated, and followed by valuable hints on the types of instruments most suitable for the particular methods of approach, including air mapping and aero-photography. The value of well logs and of the data provided by electric logging and other mechanical devices that record differentiations is especially stressed for correlation and other purposes. Profitable suggestions on the preparation and presentation of geological reports and magazine articles are given when the need for avoiding ambiguity of expression is urged. Especially noteworthy is the author's advocacy of a condensed abstract beneath the title of articles, as such is a positive boon to many busy men anxious to learn the gist of contributions. Advice concerning the preparation of maps and plans for attachment to reports warrants the consideration of all authors.

Considerable space has been appropriately devoted to the important subject of geological surveying and mapping, and on almost every one of the 147 pages of text will be found advice that could only be tendered by one with considerable personal field experience. The prominence accorded to plane-table work is in itself evidence of personal field experience, for no better or quicker method exists where the nature of the terrain permits. Samples of field notes, following reconnaissance and detailed surveys, are inserted, to convey to students the best methods of recording observations and tabulating notes. Barometric and compass surveys are described, and their limitations defined. Air photography and photo-grammetry are discussed at length, with a number of fine figures depicting the immense value of aerial work, still further improved by stereoscopic observation of maps.

Under the caption of "Subsurface Geologic Surveying including Mine Surveying," is found a brief outline of drilling methods in vogue, and the tools and appliances employed for coring and sampling. The value of micro-organisms for the correlation of beds devoid of distinctive lithological or macro-fossil evidence is made apparent, as is also the occasional utility of heavy mineral assemblages of clastic rocks. Electric logging is clearly explained and exhaustively discussed with typical illustrated examples. Reference to the utility of drilling speed records and geothermal measurements for correlation of sub-surface strata is not omitted, and a brief note on p. 600 describes recent encouraging experiments in well logging by recording the acoustic properties of formation through the medium of sound detectors. Nor is radio-activity logging neglected or caliper logging overlooked in the survey of correlation aids. Crooked holes and the ways of measuring their orientation and amount of drift are described, together with a brief paragraph on directional drilling.

The past association of the author with oilfield operations is betrayed by frequent allusions to methods and instruments that were essentially the innovations or inventions of oil men in the service of the great petroleum companies, which expended such huge sums on research. A whole chapter deals with conventional patterns, lines, and symbols commonly employed to denote geological and structural features on maps. Typical graphic log forms are shown exhibiting correlative horizons. A warning is sounded on p. 674 of the danger of assuming wells to be vertical when drawing subsurface contours on some pronounced datum bed. Examples of block and peg models are shown, as well as columnar sections with appropriate annotations, legends, and figuring. Interpretation of maps and geological computations receive apposite consideration in two chapters.

Some final advice to authors of professional reports is well worth perusal, for, in addition to those obvious needs of concise and clear language, the presentation of the contents in an orderly manner is recommended under appropriate headings. For guidance, the suggested section headings are tabulated, and each receives pertinent comment in the succeeding paragraphs.

Twenty-six paragraphs under six headings are devoted to the subject of geophysical surveying, where gravimetric, magneto-metric, seismic, and electrical methods receive considered treatment.

Although in no way disparaging the contents, it is noted that U.S. spelling has been adopted in preference to the British method in a number of instances.

Supplementary to an extremely valuable text-book, chock-full of practical advice to field workers, are the 22 appendices, introduced with a geological time-

scale and a description of the principal rock-forming minerals. Then follows a classification of igneous, sedimentary, and metamorphic rocks. Appendix 6 classifies, in convenient form for identification purposes, the principal characteristics of clastic sedimentaries. Useful charts and tables applicable to the subject end with an extensive bibliography. A. B.-T.

British Chemical Plant, 1953. London: British Chemical Plant Manufacturers Association, 1953. Pp. 356.

This new edition of the BCPMA biennial publication forms a valuable and comprehensive guide to chemical plant manufactured in the U.K. Apart from 246 pages of manufacturer's announcements, there are three classified indexes—in English, in French, in German, and in Spanish. There is also a list of members of the Association, which gives very useful details of overseas agents and associates of the firms mentioned. In all, it is an excellent and useful production. G. S.

British Petroleum Equipment. 1953 Edition. London: Council of British Manufacturers of Petroleum Equipment, 1953. Pp. 679. £2 10*s.* post free.

Since its first appearance in 1947, the CBMPE guide to British petroleum equipment has steadily increased in usefulness, and is a book which no buyer of petroleum equipment can do without. This fourth edition contains over 600 pages of announcements from members of the Council, illustrating and describing their products and their services in a readily accessible form.

In addition, there is an extremely useful "Classified list of equipment services" which shows the sources of materials, etc., under some 1500 main and sub-headings. It is comprehensive—from air-conditioning plant to wire rope thimbles—and includes such items as dumb nesting barges, paint and enamel, seismograph equipment, etc. G. S.

ADDITIONS TO THE LIBRARY

Report of Proceedings, 6th General Assembly of the International Council of Scientific Unions. Cambridge: University Press, 1953. Pp. 157 + viii. 7*s.* 6*d.*

API Publications

Specification for Portable Masts (Tentative) API STD 4D, second edition, January 1953. Pp. 9. 50 cents.

Specification for Portable Masts (Tentative) API STD 4D, second edition, January 1953. Pp. 9. 50 cents.

Specification for Casing, Tubing, and Drill Pipe. API STD 5A, eighteenth edition, March 1953. Pp. 47. $1.50.

Specification for Line Pipe. Supplement 2 to API STD 5L (twelfth edition). March 1953. Pp. 8.

Specification for High-test Line Pipe. API STD SLX, fourth edition, March 1953. Pp. 19. $1.00.

Specification for Wire Rope. API STD 9A, thirteenth edition, January 1953. 24 pp. 75 cents.

Specification for Oil-well Cements (Tentative). API STD IOA, first edition, March 1953. 6 pp. 50 cents.

Recommended Practice for Testing Oil-well Cements. API RP 10B, third edition, April 1953. 25 pp. $1.00.

Specification for Welded Oil Storage Tanks. API STD 12C, eleventh edition, September 1952. Pp. 74. $1.50.

Recommended Practice for Care and Use of Casing. Drill Pipe, and Tubing. Supplement 1. API RP SCI (fourth edition) February 1953. Pp. 1.

Bulletin on High-pressure Thread Compound. API BUL SA2, first edition, November 1952. Pp. 4. 50 cents.

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Van Ness, W. W., 1852
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Waterman, H. I., 1774
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Zavoico, S. V., 1756
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Zimmerman, P. W., 1825

Oilfield Exploration and Exploitation

Geology

1681. Geological prospecting for crude petroleum deposits. J. Wdowiarz. *Nafta* (*Krakow*), 1952, **8**, 163–7, 194–6, 222–3 (*Petroleum News Supplement*).—A summary of geological science with particular reference to oil-bearing formations. M. S.

1682. Study of the oil possibilities of the Paris Basin. D. Trumpy and B. Clavier. *Rev. Inst. franç. Pétrole*, Oct. 1952, **7** (10), 351–79.—The Paris Basin, covering about 175,000 sq. km. in France, was thought, on the basis of a well on the south flank of the Bray anticline, not to have significant oil prospects. However, the discovery of oil in the Trias and Jurassic in Alsace suggests that the above conclusion may not be correct.

The stratigraphy of the Basin is discussed in detail, and it is noted that possible source rocks exist in the Westphalian (slight), Stephanian, Asturian, Trias, Lias, Kimmeridgian (thin), and Oxfordian. There are possible reservoir rocks in the Stephanian, Permian, Trias, Lias, Bajocian–Bathonian, and Lusitanian.

The main structural features are described, and the oil possibilities of certain formations and areas are briefly examined. Extensive seismic surveys would be a necessary step in dealing with the Stephanian, the Lias sands, and the middle Jurassic, and these should be preceded by deep wells to determine the stratigraphy. This and other work should be undertaken in the national interest.

Maps, sections, and stratigraphical columns are included. G. D. H.

1683. Geological structure of the Sedlarica area as revealed by deep drilling and prospecting. A. Rubinic. *Nafta* (*Yugoslavia*), Apr. 1953, **4**, 111–15.—The structure of the Sedlarica area is described both from geographical and geological points of view. It is formed by Pliocene strata consisting of Rhomboidea sediments (157 m) and Abichi sediments (1782 m). The Pliocene strata are overlying Triassic formations. The oil-bearing strata were found to be of poor porosity and of almost no permeability, showing only traces of oil or gas. The structure was drilled in 1922–23 and later in 1949–51.

All structures on the Drave river plain were drilled on main maxima points, resulting in discoveries of oil or gas of high quality. These, however, are of no economic significance owing to the unfavourably developed facies.

Further exploration drilling ought to be directed to relative distant points on the flanks of the structure in search for more favourable oil bearings.

(Author's Abstract.)

Geophysics and Geochemical Prospecting

1684. Patents. U.S.P. 2,620,386 (12.1.50; 2.12.52). P. L. Alspaugh and G. Cook, assrs to Union Carbide and Carbon Corpn. A stratascope for continuously indicating the strata actually being cut at the time by a bore mining machine having a rotary cutting head.

U.S.P. 2,620,766 (20.3.50; 9.12.52). G. C. Seavey, assr to Sonic Research Corpn. Apparatus for transmitting a pulse, consisting of a train of sound waves of controlled frequency, into the earth.

U.S.P. 2,620,890 (1.12.47; 9.12.52). B. D. Lee and G. Herzog, assrs to Texas Co. Seismic prospecting.

U.S.P. 2,622,124 (13.9.48; 16.12.52). T. R. Homer, assr to Lane-Wells Co. An apparatus in combination with an electrical logging apparatus, wherewith the variation in natural potential difference along the length of a well borehole, relative to a remote ground, is tested by a potential pick-up electrode adapted to be moved longitudinally along such borehole, and such picked-up potential difference is conducted between the potential pick-up electrode and the remote ground through a conductor in a conductor cable and through measuring apparatus located at the surface, exterior to the borehole.

U.S.P. 2,623,097 (France 20.5.47; 23.12.52). G. Kunetz, assr to Compagnie Générale de Geophysique. A method for investigating the earth's subsoil, including steps of obtaining indications of variations with time of potential differences produced by telluric currents flowing through the earth.

U.S.P. 2,623,113 (1.11.51; 23.12.52). J. E. Bayhi and J. T. Baker, assrs to Standard Oil Development Co. Seismic prospecting with optimum geophone coverage.

U.S.P. 2,623,923 (23.4.51; 30.12.52). C. W. Zimmerman, assr to Schlumberger Well Surveying Corpn. The combination in a system for electromagnetically exploring formations adjacent to a well bore, which includes a bridge network having output terminals at a first diagonal and excited from an alternating current source connected to input terminals at a second diagonal.

U.S.P. 2,623,928 (18.10.50; 30.12.52). F. M. Bower, assr to Standard Oil Development Co. A capacitor cell for measuring the dielectric properties of a flowing stream of liq. D. A. R.

Drilling

1685. Current drilling practices in West Texas. D. Johnston and W. R. Johnson. *World Oil*, Apr. 1953, **136** (5), 141; May 1953, **136** (6), 180.—The Permian Basin of West Texas and Southeast New Mexico is characterized by a high drilling concentration and high productive capacities. Drilling is slow and expensive, and with the large number of operating rigs, possible ways of improving efficiency are of particular interest.

In general, bit weight is kept to 5000 lb/inch of bit dia, with the exception of large bits. Increased bit weight is not always desirable, in view of the added wear put on drill collars and cones and also because of greater hole deviation. Preventive measures, including routine stores inspection of bits and the use of stress relief grooves, have substantially reduced percentage of failures. Lower rotary speeds do prevent high cone losses.

The initial use of jet rock bits was unsuccessful owing to the insufficient pump power. Although high pump power is an advantage, if the dimensions of hole and drill pipe can be arranged to give a nozzle velocity in the region of 250 ft/sec, then jet bits are very useful in soft formations. Of particular interest is the increased bit life, and reduced rig-time loss. A rotary torque indicator is helpful in determining the best time to change a bit.

Chert bits are finding much more widespread use in this region. The bit is expensive, but may substantially reduce drilling costs if used with care. Normal drilling rate for chert is about 5 ft/hr, below which rate a change is necessary. The chert bit consists of spherical-nosed tungsten carbide inserts which crush hard formations.

Crooked holes present many problems, particularly where reduced bit weight is recommended. Remedial measures include: the use of supporting reamers (with smooth rollers) at various points in the string; oversize drill collars; and a recent possibility is the introduction of percussion drilling.

The use of air or gas as circulating media also presents some advantages.

A. J. H.

1686. Drilling problems in the Williston Basin. T. Dougherty. *World Oil*, Apr. 1953, **136** (5), 148.—A review of local problems, where winter conditions put necessary restriction on movement and require special covering for rigs. Mud treatments are discussed. A. J. H.

1687. Workovers revive California field. R. B. Teissler. *World Oil*, March 1953, **136** (4), 174.—The production of low gravity, high visc oil from very friable sands necessitated a careful study, particularly in view of the high rate of decline in production, and of the time devoted to maintenance. Studies made of core samples and produced fluid revealed that the sand contained water-sol clay lumps which were disintegrated by the water-base muds, and thereby caused sand movement.

The use of oil-base muds appeared to eliminate many of the previous faults. Further, to reduce sand movement, the clearances between liner and hole were reduced; the principle was to provide the greater support for the well wall. Production control revealed that there existed a critical velocity of fluid flow into well-bore, above which silt particles were believed to "jam" the immediate vicinity of the well-bore. The surface evidence of the success of the methods has been the greater period permissible between tank cleaning. Production of silt in suspension is stated to be beneficial in removing particles from the well area. A. J. H.

1688. Drilling operations continue the year round in Canada. V. H. Hunter. *World Oil*, May 1953, **136** (6), 160.—Temp in winter, ranging from −35° to −60° for over 6 weeks, create extraordinary problems. All lines should be heated, either primarily or secondarily. Mud pits and water supplies must be kept warm. Heating on the rig for personal comfort is not very effective. Of greater importance is rig "winterizing," or providing board protection. Ice on the rig floor can be reduced by using mesh floors. A. J. H.

1689. How to design a radial flow settling basin. H. H. Elliston. *World Oil*, March 1953, **136** (4), 182.—A simple formula is derived for the calculation of the efficient radial dimensions for a settling tank. Direction of flow in the tank is immaterial.

There exist two turbulent regions, one at the periphery and one at the centre. The main settling area is a ring. The horizontal velocity of the particle may exceed the vertical falling velocity, but, for obvious reasons, flow in settling area must be streamlined. A. J. H.

1690. Lost circulation can be avoided or minimized. Pt 1. J. M. Bugbee. *World Oil*, May 1953, **136** (6), 150.—Essentially, lost circulation can be minimized by studying the nature of neighbouring formations, and anticipating possible lost circulation zones, and also by using a low " over-balance," or small difference between the formation pressure and the hydrostatic pressure due to the mud. Over-balance pressure in the region of 400 p.s.i. in a well of 10,000 ft depth is permissible. Fissures are frequently opened as a result of exceeding certain critical hydrostatic pressures. Conditions similar to these are aggravated by pressure surges set up by running-in too rapidly or opening to pump too suddenly.

Remedial measures are discussed. 16 refs. A. J. H.

1691. New nitrogen impact jar eliminates jarring action. Anon. *World Oil*, March 1953, **136** (4), 124.—The energy of the jar is provided by compressing nitrogen to a high pressure. When the drill-pipe weight is taken off the jar, a partial vacuum is created on the opposing side of the piston confining the gas. Immediate expansion is prevention by the slow travel of a piston in the restricted lengths. Once this is passed, release is immediate and sudden. It is claimed that for a 4½-inch jar a blow of 416,000 lb is imparted to the fish without a shock to the derrick. Tables of specification and of field results. A. J. H.

1692. Compounded power pumps speed drilling. Anon. *World Oil*, March 1953, **136** (4), 111.—Compounded steam-driven mud pumps presented relatively few problems, but many operators have overlooked the major advantages of compounded power-driven pumps, because of certain difficulties. 2 comparable wells drilled, one with single pump, one with compounded pumps, resulted in a 32·5% cut in rotating time and 21% fewer bits for the latter case. The method required the installation of surge dampeners, automatic re-setting relief valves, and vibration hoses between low- and high-stage pumps and high-stage discharge. A typical layout is given. A. J. H.

1693. Luxury and efficiency afloat. P. L. McLoughlin. *World Oil*, Apr. 1953, **136** (5), 164.—15 photographs illustrate the Superior Oil Co barge *W. M. Keck Sr*, one of the more modern barges equipped to house 44 crew, with living quarters air-conditioned and sound-proofed, and components spread over 4 decks. A. J. H.

1694. New trailer mounted rig saves valuable rig-up time. R. E. Fuller. *World Oil*, March 1953, **136** (4), 120.—The rig has been designed for rapid tear-down, transportation, and rig-up; rig-up can be accomplished in 3½ hr. Rating is 6500 ft of 3½-inch tubing or 14,000 ft of 2⅜-inch tubing. Transportation is in 4 loads. All instruments are concentrated at the driller's position. General description. A. J. H.

1695. Here's how to rig a unitized trap. W. L. Broussard. *World Oil*, Apr. 1953, **136** (5), 164.—The complexity of mud operations gave rise to the need for a unitized system for mud treatment. The rig described is dual-purpose in that provision is made, in addition to normal mud cleaning components, for handling, storing, mixing, and generally maintaining mud stocks. Emphasis is placed on compactness, including the use of structural members for secondary purposes. Safety devices are widely distributed. Essential dimensions are given. A. J. H.

1696. How to identify casing in mixed strings. Anon. *World Oil*, Apr. 1953, **136** (5), 144.—Careful design of mixed casing strings is to no purpose if the various sizes are confused at the well-head. A routine procedure is outlined where, following upon design factors, the casing is selected, measured, and recorded on a tally sheet. Casing is loaded on to transport in such a way that on unloading, each length is in the prescribed order. Before running in, a further check is then made; differences are checked and entered on the tally sheet. Lengths are also marked for identification. A. J. H.

1697. Here's how to pull a dry pipe—and save money. Anon. *World Oil*, May 1953, **136** (6), 186.—The method is particularly recommended for bad weather conditions, and consists in balancing mud-in-hole by mud-in-pipe of slightly greater weight, and consequently of less height. It necessitates the use of an auxiliary mud tank. This serves various other purposes, such as spotting lost circulation material, standby tank, etc. A. J. H.

1698. High-pressure well-head lubricator. H. E. McKinney. *J. Petrol. Tech.*, Nov. 1952, **4** (11), *AIMME Tech. Paper No.* 3439, 261–4.—The cable used had stranded armour, and was non-circular with dia of 0·325 and 0·314 inch. The sealing element allows the cable to enter the well through a relatively long, small dia tube. In this the cyl shear area of the transfer fluid is large enough to allow only a very low rate of flow of this fluid through the sleeve under the well-head pressure of up to 5000 p.s.i. A continuous supply of transfer fluid is provided by injecting it into the sleeve a few inches downstream from the well-fluid chamber. This also prevents escape of well fluid. The transfer fluid is a grease (Shell Indus 5169). A grooved sheave pulls the cable through the sleeve, thereby avoiding the need for a large sinker. The sheave is actually a modified torus ring driven by a peripheral pinion, so reducing the weight of the pressure housing. An instrument catcher is provided in case the cable is overwound and the shear pins broken. There is also a cable cutter as a further precaution to allow the cable to fall clear of the master valve on the well-head. A cable brake and stationary cable seal are also provided. The whole is mounted on an A-frame which is adjustable in height. A reel truck carries 12,000 ft of cable, and the field unit can be assembled on a well in about 4 hr. About 2 lb of transfer fluid are required per 1000 ft of cable. Under stationary conditions the sealing element uses about 0·02 lb/min/1000 p.s.i. well-head pressure. On test at 5750 p.s.i. gas flow through the sealing element was stopped in 10 sec after starting the transfer fluid pump. G. D. H.

1699. How San Juan operators are solving mud problems. E. J. Mayhew. *World Oil*, March 1953, **136** (4), 136.—Some of the local problems are briefly reviewed. Mud control is very complicated, and cannot easily be effected according to fixed procedures. Typical of the problems are: contamination of make-up water by sub-surface waters; hydration of formations; breakdown of weak formation; and gas blowouts. A. J. H.

1700. Mud-stuck tubing recovered by string-shot back-off method. F. Scott. *World Oil*, Apr. 1953, **136** (5), 200.—It has been shown that mud may "set-up" in a well, thereby freezing the tubing. In the method outlined, successively lower "free points" are located in the tubing string, and by backing off at this point and circulating through the tubing without removing it, the heavy mud is replaced by a lighter one. Successive location of the "free point" will reveal the fact of its having been moved several hundred feet. The procedure is continued to completion. It was observed, in taking strain measurements due to torsional and tensional stresses, that the free point due to the latter was generally very much lower than that produced by torsion. In every case the torsional free point is the more important. A. J. H.

1701. Here's how to correct your mud contamination. H. L. Strider. *World Oil*, May 1953, **136** (6), 170.—The 3 main mud contaminants are cement, gypsum, and salt. Their effects on various types are discussed with reference to the type of mud more suited to specific formations. In every drilling project the factors relating to mud must be analysed with full consideration to these effects. A. J. H.

1702. Guesswork is removed in flood evaluations. N. J. Mellies and C. W. Clark. *World Oil*, May 1953, **136** (6), 216.—The drilling of a producing area by several independent operators, who kept little or no record of formation penetration, has complicated the planning of secondary recovery projects. Radio-active logging has certain advantages over other methods, and has permitted the definition of the extent of the producing formations, and also the uniformity, or otherwise, of the sand. Reference is made to actual examples, and maps are reproduced. A. J. H.

1703. Four-way perforating aids squeeze cementing. J. E. Kastrop. *World Oil*, Apr. 1953, **136** (5), 222.—The need for a method for sealing off 2 dissimilar zones has long been realized. Previously the main obstacle was the design of a suitable gun. Shaped charges and a compact design have resulted in a 4-charge gun capable of perforating 4 times on the same plane. Thus a "pancake" seal may be obtained. Field results, which are given, prove the efficiency of the method. Details of the gun and procedures are given. One ref. A. J. H.

1704. Effect of calcium chloride on high early strength cement. B. C. Craft and A. H. Stephenson. *J. Petrol. Tech.*, June 1952, **4** (6), 11–12.—The addition of calcium chloride substantially shortened the pumping time of high early strength cement, and the final set was also shortened. The slurries were 14·7 lb/gal and 15·4 lb/gal, the temp of test being 80° and 100° F. The amount of calcium chloride was varied, 2% roughly halving setting and pumping times. The cement strength was not greatly affected by small amounts of calcium chloride. The ratio of set volume to slurry volume was increased when calcium chloride was used. The data show that high early strength cement with calcium chloride can be used in accordance with API Code 32, Schedule 2. G. D. H.

1705. Gulf Coast cementing practice. R. H. Burke. *J. Petrol. Tech.*, Oct. 1952, **4** (10), 26.—In the Gulf Coast area, wells range from 300 ft to more than 15,000 ft in depth, and in temp from 100° F to more than 350° F, and the formations vary widely. Production strings are usually 5½-inch casing and hole size 7⅞–9¾ inches, and surface pipe 9⅝ or 10¾ inches. 2 plugs are used, and the top plug is pumped to a shut-off, with pumping as fast as is practicable. Mechanical cleaners and scratchers are employed. Casing is generally set through the producing zone and gun-perforated. The top plug is often below the productive zone and not drilled out.

For 12,000–15,000-ft wells, a slow setting cement is used. Low percentages of bentonite are mixed in the cement in the soft Miocene beds. In the Wilco–Eocene formations of central Louisiana, the producing thickness is less than 50 ft, with shales above and below, and water may also be found. This increases the difficulties. It was the practice to use gypsum cement ahead of the standard batch, the former being displaced to behind the pipe and allowed to act before the standard batch was squeezed behind it. Shales and volcanic ash affected by fresh water cause troubles, which may be reduced by using salt water. Remedial work is difficult.

In the Lower Cretaceous there are high pressure zones with weak zones above, with the risk of blow-outs. Proper mixing is essential, and success has also been obtained by using a batch of heavy cement ahead of normal cement. Primary cementing is not difficult in the Jurassic, but the limestones resist squeezing in remedial work. Tailor-made cement jobs have been effective in the Upper Cretaceous of Mississippi and North Louisiana. Up to 12% gel has been used, with multiple-stage cementing and block squeezing. G. D. H.

1706. Measurement of the permeability of set cement. B. E. Morgan and G. K. Dumbauld. *J. Petrol. Tech.*, June 1952, **4** (6), 16.—Well cement permeability tests with air are unrealistic. Water tests are required. A mould is prepared; after a suitable set time the cement is washed, the glazed surface removed by brushing, and the cement mounted in a permeameter. Specimens cast in ungreased moulds gave reproducible permeability results. Air permeabilities were much higher than water permeabilities, due to alteration of the cement on drying. G. D. H.

1707. Some effects of quick-freezing upon permeability and porosity of oil well cores. J. M. Lebeaux. *J. Petrol. Tech.*, Nov. 1952, **4** (11), 19–20.—The cores were cut, and cleaned and dried, and their air permeabilities were measured. They were fully or partly saturated with water, or fully saturated with oil and water before being flash-frozen in dry ice–acetone at −82° C for 15 min or in dry ice for 3–5 hr. The cores were then removed and dried, and their air permeabilities remeasured.

The first 4 cores split in the cooling bath. Another split at a sand–pebble contact. All showed permeability increases after freezing, the rise being 4–43%. The average increase for rapid freezing was 13·5%, and for a slow freezing 18·6%. Large cores

may be differently affected from small cores. The data showed that $k_b = 0{\cdot}6967k_a^{1{\cdot}0296}$ (slow freezing) and $k_b = 0{\cdot}7044\,k_a^{1{\cdot}032}$ (quick freezing), k_a and k_b being the permeabilities after and before freezing, respectively. G. D. H.

1708. Methods of electric logging. J. A. Klotz. *J. Petrol. Tech.*, Sept. 1952, **4** (9), 19–20.—For max usefulness electric logging should be used in conjunction with core and cutting data, formation tests, mud logging, drilling rates, etc. Without these it can be used for correlation to show formation depths and to indicate the fluid contents of the rocks. The resistivity log depends on rock porosity, pore form, water saturation, and salinity. The S.P. log depends on changes in rock type, salinity differences between the formation water and drilling fluid, and any filtration through the mud cake.

The use of electric logs to determine water saturation and formation water salinity is briefly described, and the formation factor is discussed, together with influence of electrode spacing on the apparent resistivity. G. D. H.

1709. Patents. U.S.P. 2,620,029 (21.12.48; 2.12.52). G. F. Turechek and R. A. Phillips, assrs to Lane-Wells Co. Electrical connector for well tools.

U.S.P. 2,620,035 (19.12.50; 2.12.52). J. M. Clark. Safety device for catching or collecting objects in well bores.

U.S.P. 2,620,036 (19.5.49; 2.12.52). C. K. Morgan, assr to Lane-Wells Co. Self-sealing well packer apparatus.

U.S.P. 2,620,037 (2.7.51; 2.12.52). W. R. McClendon, assr to Halliburton Oil Well Cementing Co. A cementing head for use in cementing casing in an oil well or the like.

U.S.P. 2,620,165 (31.1.49; 2.12.52). C. S. Crickmer, assr to C. A. Miketta. A coupling device for use in a drilling string in a well for transmitting rotation and absorbing and dampening torsional shocks and vibrations.

U.S.P. 2,620,300 (2.9.49; 2.12.52). R. J. Given, assr to Phillips Petroleum Co. A water-base drilling mud comprising, in combination, sufficient water to maintain the mixture fluid, sufficient clayey material to form a filter cake on the wall of the well, a sufficient amount of caustic alkali to maintain the mud alkaline, and a sufficient amount of a caustic extract of oil shale to maintain the visc of the mud low enough for the mud to be circulated.

U.S.P. 2,621,067 (11.9.44; 9.12.52). O. Jacobson. A device for removing extraneous matter from well shafts.

U.S.P. 2,621,132 (Netherlands 21.6.48; 9.12.52). R. N. J. Saal, assr to Shell Development Co. A fluid cement slurry having a retarded setting action for use in well cementing operations at temp over atm, the cement comprising a hydraulic cement having admixed therewith from 0·2 to 2·5% of a gasoline insoluble high mol. wt. oxidized paraffin wax.

U.S.P. 2,621,485 (21.2.47; 16.12.52). D. W. Ross, assr to Stanolind Oil and Gas Co. A separately stable foundation unit resting on the marine floor and suitable for being connected to similar foundation units to form an integral structure.

U.S.P. 2,621,732 (24.2.47; 16.12.52). E. L. Ahlgren. A well-shooting gun comprising a gun body, an electric generator, ignition means in the body for igniting the charge, an electrical conductor leading from the generator to the ignition means and including a switch and generator driving means.

U.S.P. 2,621,742 (26.8.48; 16.12.52). C. C. Brown. Apparatus for cementing well liners.

U.S.P. 2,621,743 (12.7.47; 16.12.52). M. O. Johnston, assr to Johnston Testers Inc. Side wall tester for wells.

U.S.P. 2,621,744 (15.12.48; 16.12.52). L. W. Toelke, assr to McCullough Tool Co. A plugging device for sealing a well bore.

U.S.P. 2,621,745 (25.5.50; 16.12.52). L. W. Toelke, assr to McCullough Tool Co. A setting tool for releasably connecting a well tool to a well string.

U.S.P. 2,621,895 (8.12.50; 16.12.52). L. W. Toelke, assr to McCullough Tool Co. A severable safety joint for pipe strings, comprising a tubular body member adapted to be connected into a pipe string as a part thereof, and a detonatable explosive charge embedded in the wall of the body member intermediate to the inner and outer surfaces of the wall and shaped to partially sever the body member when detonated.

U.S.P. 2,621,959 (31.10.49; 16.12.52). B. F. Wiley, assr to Phillips Petroleum Co. An overshot tool.

U.S.P. 2,621,960 (22.11.46; 16.12.52). G. E. Justice and L. W. Storm, assrs to Houston Oil Field Material Co. A tool to be lowered into and telescoped over a substantial length of pipe in a well and manipulated therein to grip such pipe.

U.S.P. 2,622,334 (4.3.49; 23.12.52). B. F. Wiley, assr to Phillips Petroleum Co. A logging caliper comprising, in combination, a casing, a shaft journalled therein, a series of arms geared to the shaft, a latching device for holding the shaft, means biasing shaft, means for releasing latching device, and a telemetering device to indicate the angular position of the shaft.

U.S.P. 2,622,404 (24.3.49; 23.12.52). G. P. Rice. Offshore drilling apparatus and method of installing the same.

U.S.P. 2,623,015 (16.10.50; 23.12.52). P. W. Fischer, assr to Union Oil Co of California. An oil-base drilling fluid comprising a mineral oil base having dispersed therein between *ca* 1 and *ca* 10% by weight of an oil-dispersible metal soap, between *ca* 0·1 and *ca* 5% by weight of a hydratable clay, between *ca* 0·2 and *ca* 10% by weight of water, and between *ca* 0·2 and *ca* 5% by weight of a drying oil.

U.S.P. 2,623,594 (27.10.49; 30.12.52). B. W. Sewell, assr to Standard Oil Development Co. Apparatus for securing fluids from subterranean strata encountered by a borehole.

U.S.P. 2,623,595 (23.10.45; 30.12.52). T. S. West, assr to Blanco Oil Co. The method of well completion which comprises the positioning of a screen member, the filling of the space between the screen member and a fluid producing formation with a filtering material, the filling of the well space between the screen member and the well bore, and the removing of the top closure to provide a path for fluid flow.

U.S.P. 2,623,851 (19.1.51; 30.12.52). R. A. Salathiel, assr to Standard Oil Development Co. A drilling mud comprising a major amount of suspension including finely divided solid inorganic material in an aq liq vehicle and a minor amount of a water sol inorganic salt of sulphonated rubber. D. A. R.

Production

1710. Water flooding in Eastern Kansas and Oklahoma. D. M. Moon. *J. Petrol. Tech.*, June 1952, **4** (6), 17.—To date most of the water flooding in the Oklahoma–Kansas area has been in the Peru, Squirrel, Burbank, Bartlesville, Cromwell, and Tucker sands. These are shoe-string and offshore sands. Depths are 225–3500 ft, and oil gravities 18°–40°, with visc up to 125 cp. Well spacing is 220–1320 ft. Various patterns have been used according to the shape of the sands. Some plug all old wells and redrill entirely; others retain some old wells and drill some new ones. Salt water for flooding is obtained chiefly from the Mississippi limestone and the Wilcox. Cement-lined pipe is used. There are some closed systems. For depths less than 1000 ft, 2- to 3-acre spacing is used. Generally water input rates are below 4 brl/ft in shallow areas, and if oil visc exceeds 35 cp rates under 2 brl/ft are recommended. Some floods are pumped; some are flowed from the beginning. 10-acre spacing is usual for depths of 1000–2000 ft. Input rates are 10–15 brl/ft. For greater depths the same spacing is preferred, with input rates up to 40 brl/ft, and little new drilling.

Breakdowns due to fractures are encountered in the shallower floods. There are thief sands in places. Most serious corrosion problems are in the producing wells. G. D. H.

1711. Dual completions pay off in Illinois. F. H. Hunter. *World Oil*, March 1953, **136** (4), 163.—Owing to the thickness of pay, frequently as little at 15 ft for sands and 10 ft for limestones, and to the number of zones, it has been found economical to

complete for several zone production. The deepest zone is generally left open to the casing, and higher zones completed successively by dissolving alloy casing with chemical for sand formations, and by perforating for limestone formations. Where the sand formations are to be hydraulically fractured, the casing is perforated. This gives better control. A. J. H.

1712. Stop that thief. F. R. Cozzens. *World Oil*, May 1953, **136** (6), 234.—An extensive zone, as defined by the upper and lower pays, is seldom 100% productive, and the intermediate barren zones may remove much oil from the producing area and disperse it widely. It follows that in the initial drilling stages, such thief zones must be located—if necessary by coring the whole "productive" depth—and precautions taken to minimize any disturbance of the non-porous isolating layers. If the productive pays have to be treated, the barren zones should be cased off temporarily by alloy or acid soluble pipe. In general, the thief zones should not be exposed to normal treatment processes, and the completion operations should be achieved as rapidly as possible. A. J. H.

1713. Field testing can prevent flange leaks. M. R. Jomes and F. N. Balawin. *World Oil*, May 1953, **136** (6), 201.—A routine test procedure is outlined where ring-seals are tested periodically on Christmas trees. All seals, except those below the master valve, are subject to inspection. With regard to seal deterioration, the only difference between a "corrosive" and a "non-corrosive" well is one of degree. Similar tests can be extended to drilling control assemblies. In each case it is recommended that the full test pressure be applied; frequently, complete tests are carried out only in the "shop." Main requirements of sealing surfaces are that they should be of a high finish, and the ring should be of softer material than the body. Temp effects must be considered. A. J. H.

1714. Petroleum reservoir mechanics. J. A. Klotz. *J. Petrol. Tech.*, Nov. 1952, **4** (11), 27.—K, the rock permeability, is an empirical factor derived in relating certain measurable quantities concerning flow through rock. Darcy's law has parallels in other branches of science, and in oilfield work it is possible to draw on the knowledge gained elsewhere on potential field problems. The radial flow formula indicates qualitatively the relations of certain factors, but is too simple to predict the actual flow. However, it can be modified so as to obtain indications of the effects of the various permeability distributions around a well, and so a guide is obtained on the consequence of plugging of the formation. More advanced mathematics permit discussion of the influence of perforated liners on production, and certain equations show that the rate depends less on the fraction of the well bore surface, which is open, than on the number of rows of slots. The equation shows that raising this fraction from 0·02 to 1 may only double the rate.

These various equations, by emphasizing the assumptions involved, provide a firmer foundation for making guesses relating to the field problems, even though they do not show everything about reservoir mechanics. G. D. H.

1715. Production from gas depletion reservoirs. J. A. Klotz. *J. Petrol. Tech.*, Dec. 1952, **4** (12), 24–6.—A gas depletion reservoir is one in which all the driving force comes from compressive energy stored in oil and gas within the reservoir. In one sub-type all the gas is dissolved; in the other, some gas is free. Gravity effects must be negligible, and the reservoir must have no outlets to active aquifers or to other reservoirs. The characteristics are a low gas : oil ratio at first, then rise to a peak, and then a drop as total depletion is approached. It has a continuous and rapid pressure decline at rates proportional to extraction, though with a break at the bubble point. The productivity declines and the gas : oil ratio is independent of the structural position of a well. There is low water production.

Production behaviour is based on differential equations, or on their integration to give the material balance methods. Some of the assumptions involved are implicit in the definition of the reservoir type. The others involve average permeability, average compressibility, average pressure, and average oil and gas saturations. Usually, gas evolution is assumed to be differential, and the reservoir volume is taken to be constant.

The Schilthuis equation applies only below the bubble point, and by a trial and error approach can be made to yield data on the pressure and gas : oil ratio as a function of oil production, with the main uncertainty due to the values of the relative permeability ratios. Subsequently, time is introduced as a factor by other equations.

Well spacing and producing rates are largely determined by economic considerations, and must be carefully evaluated in each reservoir. G. D. H.

1716. Bubble formation in supersaturated hydrocarbon mixtures. H. T. Kennedy and C. R. Olson. *J. Petrol. Tech.*, Nov. 1952, **4** (11), *AIMME Tech. Paper No.* 3441, 271–8.—A technique is described for studying the formation of gas bubbles on silica and calcite crystals from supersaturated hydrocarbon mixtures. Statistically, the number of bubbles formed per second per unit area of crystal surface was a function of the supersaturation only. The bubbles formed on the solid surfaces rather than in the oil. In the test the frequency ranged from 0·22 at 800 p.s.i. to zero at 30 p.s.i. supersaturation. At the latter pressure no bubble was formed in 138 hr. The presence of water had no measurable effect on the frequency.

From the observations it is calculated that the max supersaturations in reservoirs cannot appreciably exceed 30 p.s.i., and the average supersaturation may be much less. The number of bubbles formed in unit volume depends on the rate of diffusion of gas through the oil and on the pressure decline rate due to production. For decline rates of 0·1, 1·0, and 10 p.s.i/day the number of bubbles formed will be 40, 400 and 4000/cu. ft. Even at higher rates of pressure decline, only one bubble is formed per million rock pores, suggesting that the increase in gas saturation in reservoirs is by the enlargement of gas bubbles into gas masses encompassing many pores. Variations in the manner in which gas is distributed in permeable media may account for different relative permeabilities for the same gas saturation, and may explain differences between laboratory and field data in the same kind of rock. G. D. H.

1717. Reduction in permeability with overburden pressure. J. Flatt and D. H. Davis. *J. Petrol. Tech.*, Dec. 1952, **4** (12), 16.—Gas permeabilities have been measured on core samples suitably jacketed and placed under hydraulic pressures of 0–15,000 p.s.i. The specific permeability was found to decrease with increased hydraulic pressure, the main change taking place between 0 and 300 p.s.i., and being about 10–42%. The ordinary permeabilities of the 8 cores used were 4–632 mD.

The error introduced by neglect of the change in permeability under pressure may account for part of the difference between actual well productivity and that calculated from core analysis. G. D. H.

1718. What about compressed air? L. K. Shallenberger. *World Oil*, Apr. 1953, **136** (5), 155.—The advantages of air as a circulating medium are obvious in regions where water is scarce and where climatic conditions are such that freezing water is a problem. The advantages of air lie in its more rapid removal of the cuttings, which leaves few cuttings to be re-ground, and also removes dust from the proximity of cone bearings. Where caverns are encountered, the reduction in air velocity, with increased hole dia, results in deposition of particles and gradual sealing of lost circulation areas. The presence of water, within limitations, need not be detrimental. Air is of particular advantage where low-pressure productive zones are encountered. More emphasis has been put on hard rock drilling, and its use in unconsolidated formations warrants studying. A. J. H.

1719. Reservoir fluid properties. J. A. Klotz. *J. Petrol. Tech.*, Sept. 1952, **4** (9), 23–4.—Fluid samples truly representative of reservoir fluids are almost impossible to obtain. Bottom-hole samples give a correct sample of the fluid in the tubing at the time the sampler is closed. Much depends on the behaviour of the well. If it is closed in sufficiently long to give static separation in the bore, and samples at different levels in the liq have bubble points within 1–2%, they are probably representative of the reservoir fluid.

Recombined surface samples taken from traps are dependent on knowing the correct production rates for accuracy.

Samples from flow lines depend on the homogeneity of the fluid moving in these lines. Rate of sampling is important.

Production behaviour is not always a ready guide to the existence of a condensate reservoir, and the only sure test is to find whether the critical temp of the fluid is below the reservoir temp. In retrograde condensation, the amount of liq that separates and then revaporizes on pressure drop depends on the composition of the system and the original reservoir temp and pressure, and critical temp and pressure.

In dissolved gas systems, flash or equilibrium vaporization occurs in traps, and differential vaporization in the reservoir. In the latter, the gas evolved early will differ from that evolved late. Both types of vaporization occur in the flow from the reservoir to the trap. G. D. H.

1720. How to select a subsurface pump plunger to fit the job. K. N. Mills. *World Oil*, May 1953, **136** (6), 224.—The importance of good design in pumping installations cannot be over-emphasized. There exist 2 main groups of pump seals: metal-to-metal and soft-packed seals. With the former, slippage of oil must be permitted by use of a suitable clearance between plunger and body; the slippage is a function of the cube of the clearance. Wear is necessarily greater in the case of soft-packed pumps, and in their selection this fact must be considered. Of the latter group, seals used are: cup type, for which the correct number of cups is very important; ring-type, where frictional drag is due to initial dimensions and swelling action, and not to fluid head, as with cups; re-pack type, which has a high frictional drag at great operating depths; and combination type. Metal guide rings in soft packed pumps reduce wear due to lateral thrust; also cup extensions in metal-to-metal pumps prolong the service life. Graphical data. A. J. H.

1721. Boron compounds used as water-flood tracers. P. G. Carpenter, T. D. Morgan, and E. D. Parsons. *World Oil*, Apr. 1953, **136** (5), 214.—Boron, in the form of borax or boric acid, was found to satisfy the essential tracer requirements, including its detection at very low concentrations, its absence in natural waters, the absence of any reaction with oilfield water, its solubility and availability. The method of analysing is described in principle. 4 tracer injection projects are discussed with reference to data given in graphical form. A. J. H.

1722. New automatic tank battery. W. A. Middleton and E. B. Laguki. *World Oil*, Apr. 1953, **136** (5), 195.—Detailed description of the automatic unit which uses two tanks fed from a field separator. High- and low-level valves, set with time delay switches, operate delivery pumps. Selective sampling is also arranged, and temp and operating periods are recorded.

Diagrams. A. J. H.

1723. Electronics speeds gas volume calculations. A. C. Buchanan and H. Skinner. *World Oil*, March 1953, **136** (4), 186.—The punched card system as applied to gas measurement charts is described generally. It is finding wider application because of its convenience, speed, and the way in which it obviates laborious and monotonous calculations by technicians. The method does not require an exclusive department, being carried out by the accountancy department, along with other routine work. A. J. H.

1724. It pays to know your petroleum. Pt I. N. J. Clark. *World Oil*, March 1953, **136** (4), 165.—The volumetric behaviour of oils and gases is discussed in general terms. Reference is made to: mol attraction and its effect on gaseous mixtures; shrinkage of oil; retrograde gas condensate; wet and dry gas. A. J. H.

1725. X-ray shadowgraph studies of area sweep-out efficiencies. R. L. Slobod and B. H. Caudle. *J. Petrol. Tech.*, Nov. 1952, **4** (11), *AIMME Tech. Paper No.* 3440, 265–70.—The porous plate is saturated with one phase, and this is displaced by a second phase. One of the phases has an X-ray absorbing material such as iodobenzene. The distribution of the phases is determined by taking X-ray shadowgraphs. Quantitative saturation data can be obtained by density studies on the shadows, using a step-wedge of aluminium for comparison. The porous medium was fused alundum in $\frac{1}{4}$-inch plates held in metal holders. The remaining exposed surfaces were sealed with ceramic type glaze. Fluids were injected through the metal fittings. With X-ray source 30 inches from the film, a 0·5-sec exposure was used at

5 mA and 56 kV. A check with potentiometric results for a 5-spot pattern with unit visc ratio was made by displacing non-X-ray absorbing oil with absorbing oil of the same visc. The sweep efficiency on break-through was 69% (average of 2 electrolytic and 4 numerical solutions was 72·2%). The mobility ratio was then varied between 0·1 and 11 for the same pattern, giving sweep efficiencies of 50–100% for miscible phases. There was good agreement for the 2 types of systems over the common ranges. It therefore seems legitimate to use miscible phase data.

Fingering due to non-uniformity of the porous medium is most marked at low mobility ratios, and practically vanishes for mobility ratios exceeding one. Thus, initial break-through may give erroneous sweep efficiencies at low mobility ratios.

The technique may be extended to investigate the effects of barriers, varying permeabilities, fracturing, etc. G. D. H.

1726. Patent. U.S.P. 2,623,596 (16.5.50; 31.12.52). L. P. Whorton, R. Brownscombe, and A. B. Dyes, assrs to Atlantic Refining Co. A method for recovering oil from a subterranean oil reservoir in communication with which are an injection well and a producing well. D. A. R.

Oilfield Development

1727. Oil development in Chile. J. L. Porter. *J. Petrol. Tech.*, Nov. 1952, **4** (11), 17.—The Chilean oilfields are in the Magellanes basin, which covers 20,000 sq miles and has a max sedimentary column exceeding 35,000 ft. Oil was discovered at Manantiales in 1945, at a depth of 7,500 ft by a Government-owned company. Subsequent discoveries of oil or gas in Tierra del Fuego were at Esporo, Angostura, Victoria Sur, Victoria Norte, Chanarcillo Sur, and Sombrero, and at Punta Delgado on the mainland. 21 Americans are employed in supervisory or advisory capacities. 5 rigs are in operation.

In the Springhill sand area there are no serious drilling problems. Surface casing is set through 100–400 ft of glacial material, and the production string is set over or through the Springhill sand. Rock bits are used throughout, and each well takes 50–90 days.

5 of the fields are gas-condensate with a thin black oil belt, 2 are oilfields with gas caps, one appears to be a gas-condensate field, and the ninth has yet no known gas cap. The Springhill sand has permeabilities of 0–1000 mD, and is 0–120 ft thick. All the fields show signs of partial water drive. Bottom-hole temp are about 240° F, and pressures about 3250 p.s.i. The oil is 40°–50° API. It is planned to re-pressure Manantiales. In the other fields withdrawals have been such as not to reduce the pressure much. The present output is 2500 b.d. from 6 fields.

2 geophysical parties are at work, and usually 4 geological parties operate in the summer months. Out of 14 wildcats drilled since 1945, 9 have found oil or gas.
G. D. H.

1728. Petroleum development of Colombia. V. Oppenheim. *J. Petrol. Tech.*, Nov. 1952, **4** (11), 11–15.—The principal sedimentary basins of Colombia are of Tertiary age, and in most cases underlain by marine early Tertiary or Cretaceous beds. Apart from this they have marked differences. 5 main basins are known.

In 1951 Colombia produced 38,148,929 brl of oil from 17 fields in 7 concessions—one in the Northern Coastal basin (Difícil), one in the South Maracaibo basin (Barco), 5 in the Middle and Upper Magdalena basin (De Mares, Yondo, Cantagallo, Teran-Guaguaqui, and Ortega). At present there are about 500 concessions and private land leases in the more accessible and geologically suitable basins.

Full-scale production from the De Mares concession began in 1926 when a pipeline to Mamonal was opened. The contract lapsed in 1951, and the concession is now operated by Empresa Colombiana de Petróleo. To the end of 1951 the Infantas, La Cira, Colorado, and Galan fields had produced 416,978,870 brl of oil. The estimated reserves of the proven 18,711 acres is about 125,000,000 brl.

The first producer of the Barco concession was drilled in 1920. At the end of 1951, fields had 123 producers, the cumulative output being 73,474,117 brl, and proved area 23,710 acres out of 460,000 acres now remaining from the original concession of about 1,000,000 acres. 12 main domes have been defined, and production obtained

at Petrolea (North and South), Rio de Oro, Carbonera, Tres Bocas, Socuavo, and Tibu.

The Yondo concession includes the Casabe field discovered in 1941. At the end of 1951, 259 producers had given 44,025,613 brl of oil.

The Dificil field has 14 wells, which have given about 5,000,000 brl of oil from an Oligocene reef limestone. The Totumal field of the Middle Magdalena basin produces from the Cretaceous. Other basins have indications of oil in the Miocene, Oligocene, Eocene, and Cretaceous.

Production is limited by pipeline and refinery facilities. The pipeline capacities do not greatly exceed the present actual and potential outputs, 106,242 b.d. and 124,000 b.d., respectively.

Cumulative production amounts to 542,000,000 brl. G. D. H.

1729. It pays to know your petroleum. Pt II. N. J. Clark. *World Oil*, Apr. 1953, **136** (5), 208.—Concluding section on simplified theory of petroleum, dealing particularly with oil and gas reserves. 10 refs. A. J. H.

Transport and Storage

1730. North America's largest crude line is now in operation. Anon. *World Oil*, May 1953, **136** (6), 256.—A 579-mile 26-inch line from Colorado City, West Texas, to Nederland, East Texas, is now delivering crude at the rate of 300,000 b.d. When all booster stations are in operation, capacity will be increased to 400,000 b.d., with a possible maximum of 440,000 b.d. It is claimed to be economical, and pump installations require only small operating crews. The line is conventional, except for its size. A. J. H.

1731. Service pipeline completes "Big Inch" programme. *World Oil*, March 1953, **136** (4), 210.—Fourth in a series describing the work of major pipeline companies in the U.S.A., of particular note is the "big inch" line from Drumright, Oklahoma, to Manhattan, consisting of 20-inch and 22-inch thin wall, high-tensile pipe. A. J. H.

1732. Reduce evaporation during storage. O. Gerbes. *Oil Gas J.*, 22.6.53, **52** (7), 286.—Data are presented showing that under Gulf Coast conditions, use of white paint on a double deck floating roof tank prevents boiling of 13·3 p.s.i. Ryp natural gasoline with attendant high rate of loss, and permits storage of 16 p.s.i. Ryp natural gasoline without loss. Additional data includes pertinent temp measurements. G. A. C.

1733. Pressure-rate-drop settings for automatic shutdown devices. G. Proper. *Oil Gas J.*, 22.6.53, **52** (7), 234.—The results are given of a safety check on automatic shutdown devices on the block valves of the main gas pipeline in Virginia, Maryland, Pennsylvania, and New Jersey. The systems are described, and flow sheets depicted. G. A. C.

1734. Patents. U.S.P. 2,619,980 (Australia 25.7.48; 2.12.52). A. H. Allsopp. A fuel-feeding system for gravity feed of liq fuel to a consumer.

U.S.P. 2,619,984 (21.5.48; 2.12.52). R. A. Ashton and H. C. C. Lammermann, assrs to Emsco Derrick and Equipment Co. A variable ht liq supply means for use with a liq utilizing device.

U.S.P. 2,620,660 (28.12.49; 9.12.52). L. M. Goldsmith, assr to Atlantic Refining Co. A gauge for determining the level of material in an enclosed container having a sighting port in the top surface.

U.S.P. 2,620,933 (8.1.51; 9.12.52). J. D. Lankford, F. J. Trotter, and F. W. Taylor, assrs to the U.S.A. (Secretary of the Interior). A device for maintaining a predetermined level of particulate solid material in a container.

U.S.P. 2,620,937 (21.9.49; 9.12.52). B. E. Halloran, assr to Texas Co. Drum hoisting and conveying apparatus.

U.S.P. 2,622,255 (27.7.48; 23.12.52). B. V. Nooy, assr to Standard Oil Development Co. Pipeline cleaning device. D. A. R.

Refinery Operations

Refineries and Auxiliary Refinery Plant

1735. Heat transfer. B. E. Lauer. *Oil Gas J.*, 22.6.53, **52** (7), 335; 29.6.53, **52** (8), 109.—Pt 35 of the series continues with coeff of heat transfer through film between outside surface of bank of cool tubes and a warm gas.

Pt 36 deals with coeff of heat transfer through film between outside surface of bank of cool tubes and a warm liq. G. A. C.

1736. Compressor calculations—5. R. W. Brooks. *Oil Gas J.*, 25.5.53, **52** (3), 259.—Compressor efficiencies are dealt with in this issue of the Engineering Reference Section, and charts show machine efficiencies for typical compressors. G. A. C.

1737. Pump selection—1. R. L. Jacks. *Oil Gas J.*, 29.6.53, **52** (8), 103.—This is a new series in the Engineering Reference Section dealing with general design procedure for specifying pumps for particular services. A pump-selection chart is given. G. A. C.

1738. Cost of handling and firing coal or fuel oil—1. N. L. Nelson. *Oil Gas J.*, 25.5.53, **52** (3), 265.—Cost of handling coal is about 16–60 cents/brl (4·12 brl = heating value of 1 ton coal) greater than cost of handling oil. Coal must, however, be thawed before unloading in temp below freezing point. Mono-rail hoist, lift truck, and a continuous stoker feeder systems are discussed. G. A. C.

1739. Control station centralized. Anon. *Petrol. Refin.*, 1953, **32** (6), 104.—International Refineries' new plant near Duluth, Minnesota, which began operation in May, is designed for continuous-flow operation from crude to finished product, and is fully automatic, with a central control station for inspection of critical conditions throughout the plant. Initial output is ½ million g.p.d. finished products. R. D. S.

1740. Area versus centralized maintenance. H. A. Fohl. *Petrol. Refin.*, 1953, **32** (6), 109–12.—A discussion of this problem, based on an actual conversion to centralized maintenance, reaches the conclusion that a balance between the two must be struck for efficient working. R. D. S.

1741. Better caustic utilization. A. V. Sierra. *Oil Gas J.*, 22.6.53, **52** (7), 252.—A description is given of 6 major units of the Cities Service Refinery Corpn at Lake Charles, Louisiana, which use caustic soda in their operations. These include unisol, regenerative caustic, blend oil, kerosine, and furnace oil units. Flow sheets are given. G. A. C.

1742. New light on electric-motor maintenance. F. H. Walker and W. J. O'Meara. *Oil Gas J.*, 25.5.53, **52** (3), 172.—Results are given of a test programme initiated by Atlantic Refinery Co on 34 2-pole motors ranging in sizes through 25 h.p. The test lasted 5 years and was carried out to determine whether standard totally enclosed " off-the-shelf " motors can operate continuously for 5 years on a single greasing.

Results show that 5 years is too long a period in this service for motors to run on a single lubrication without appreciable bearing failures. Hence, a 3-year lubrication interval has been adopted for motors of this type and size. G. A. C.

1743. Patents. U.S.P. 2,620,175 (20.12.48; 2.12.52). L. J. Weber, assr to Phillips Petroleum Co. Pebble heater apparatus.

U.S.P. 2,620,822 (13.12.47; 9.12.62). R. A. Peterson and J. Howell. Lock valve for fuel tanks.

U.S.P. 2,621,399 (3.4.47; 16.12.52). A. C. Thompson, assr to Koppers Co. A method of welding joints in a process for constructing a metal vessel which comprises a series of panels which are bolted together and have outwardly opening crevices at the bolted-together joints through which air can escape when the internal air pressure in the vessel is greater than atmospheric pressure.

U.S.P. 2,621,718 (7.12.50; 16.12.52). W. F. Krautter and W. I. E. Kamm. Pulse jet heater with automatic starting and control system.

U.S.P. 2,622,850 (G.B. 24.3.49; 23.12.52). W. Tipler, assr to Shell Development Co. Matrix for heat regenerators. D. A. R.

Distillation

1744. Determination of oil carry-over in steam distillation. D. K. Knight and D. Rowe. *Oil Gas J.*, 29.6.53, **52** (8), 105.—3 examples are worked out with the aid of a graph to determine carry-over in steam dist. G. A. C.

1745. Mass transfer rate in packed columns; its analogy to pressure loss. S. Ergun. *Chem. Engng Progr.*, May 1952, **48** (5), 227–36.—The existence of analogies between mass-transfer rate and pressure loss in packed columns is indicated, and general equations formally relating mass-transfer rate to variables relating to packed columns are demonstrated. A new general form of mass transfer factor, applicable to all packed beds, is introduced, and the existence of a one-to-one correspondence between the new mass-transfer factor and a new friction factor, introduced for pressure drop in packed columns, is shown. Relationships so developed are tested, with published data and their applicability indicated. J. G. H.

1746. Patents. U.S.P. 2,620,294 (15.4.49; 2.12.52). C. S. Carlson, assr to Standard Oil Development Co. An improvement in the separation of a normal primary alcohol from a branched alcohol by extractive dist, employing water as the extractive dist solvent to modify the relative volatilities of the alcohols, the alcohols having 2 to 4 carbon atoms per mol and forming aq azeotropes which have b.p. that differ by less than 5° C.

U.S.P. 2,619,814 (22.4.50; 2.12.52).—Kniel, assr to Lummus Co. A method of separating a mixture of light normally gaseous hydrocarbons into a light fraction and a heavy fraction by fractional dist.

U.S.P. 2,622,060 (26.1.50; 16.12.52). M. O. Robeson and E. Taylor, assrs to Celanese Corpn of America. In a process for the separation of 1 : 2 -propylene oxide from a crude mixture of 1 : 2-propylene oxide containing methyl formate as an impurity, the step comprises subjecting the crude 1 : 2-propylene oxide to an extractive dist.

U.S.P. 2,623,844 (29.7.47; 30.12.52). H. W. Scheeline, assr to Standard Oil Development Co. A process for the separation of *iso*prene of high purity from a hydrocarbon fraction rich in various C_5 hydrocarbons by extractive dist with dimethyl sulpholane.

U.S.P. 2,623,813 (16.8.50; 30.12.52). J. R. Strong, assr to Universal Oil Products Co. An apparatus for contacting liq comprising a contacting tower, an imperforate deck plate, a fluid distributing header, a vertical riser line, means forming a liq receiving chamber. D. A. R.

Absorption and Adsorption

1747. Refining with adsorbents. V. A. Kalichevshy and K. A. Kobe. *Petrol. Refin.*, 1953, **32** (6), 95–100.—Pt I of a 5-part series reviews the types and physical and chemical properties of the principal adsorbents used by the petroleum industry. 197 refs. R. D. S.

1748. Arosorb process. J. I. Harper, J. L. Olsen, and F. R. Sheerman. *Chem. Engng Progr.*, June 1952, **48** (6), 276–80.—The Arosorb process is a commercial application of the selective adsorption power of silica-gel to separate various types of organic compounds, particularly aromatics, from hydrocarbon streams. Process variables and other chemical engineering factors entering into the design of an Arosorb unit are discussed, and the factors involved in setting up a silica-gel case cycle for a typical feed stock are covered. The influence of percolation rate, pressure drop, height, and

number of cases is considered in relation to the shape of silica-gel beds. Characteristics of the silica-gel used are noted, and expected life is discussed. Instrumentation features peculiar to the process are briefly described. J. G. H.

1749. New McKamie processing facilities operating at 50 million cubic feet daily. K. G. Pearce. *Oil Gas J.*, 25.5.53, **52** (3), 152.—The plant has a capacity of 50 million cu. ft. of gas per day. Gas and liq sweetening, dist stabilization, absorption recovery of natural gasoline and L.P.G. fractions, gas dehydration, and injection units are described. G. A. C.

1750. Patent. U.S.P. 2,621,149 (21.2.48; 9.12.52). J. W. Scott and S. Eagle, assrs to California Research Corpn. An improved method in an adsorption separation process wherein a solid adsorbent mass is alternately contacted with a liq feed and with a stripping liq to remove the adsorbate from the adsorbent and regenerate the adsorbent for re-use. D. A. R.

Solvent Extraction and Dewaxing

1751. Hydrotropic extraction of certain organic compounds containing oxygen. E. C. Lumb and P. A. Winsor. *Industr. Engng Chem.* (*Industr.*), 1953, **45,** 1086–93.—Outlines the theory of hydrotropic extraction, and illustrates general considerations by specific reference to the extraction of octanols and other alkanols from hydrocarbons, using salt solutions such as potassium *n*-butyrate. E. J. C.

1752. Ternary system: furfural–methyl isobutyl ketone–water at 25° C. J. B. Conway and J. B. Philip. *Industr. Engng Chem.* (*Industr.*), 1953, **45,** 1083–5.—Data reported on above system as part of a programme investigating the recovery of furfural from aq soln. E. J. C.

Cracking

1753. Sinclair has new reforming process. Anon. *Petrol. Refin.*, 1953, **32** (6), 143–4.—An account of the results obtained from a new platinum cat for reforming, which is claimed to isomerize paraffins and naphthenes, dehydrogenate naphthenes to aromatics, cyclize paraffins to aromatics, and minimize hydrocracking to lighter gases. The cat can be used for either continuous or regenerative processing, and is estimated to cost between 2 and 10 cents/brl reformate, depending upon the feed stock and the product required. Details of the products obtained from crudes from Mid-Continent, Venezuela, Kuwait, and Pennsylvanian fields are given. R. D. S.

1754. Gaseous fluidization of solid particles. R. D. Toomey and H. F. Johnstone. *Chem. Engng Progr.*, May 1952, **48** (5), 220–6.—A theory of fluidization is developed based on the forces and energy transformation existing within a fluidized system. The system is assumed to attain the most stable configuration, and the particles are shown to be at their terminal velocities. From these considerations, the average Reynolds number in the dense or continuous phase is essentially independent of the superficial gas velocity. An analysis of the energy transformations results in a general equation relating the pressure drop to the superficial gas velocity and particle dia, enabling the gas flow through the interstices of the bed to be estimated, both at incipient fluidization and at higher velocities. J. G. H.

1755. Patents. U.S.P. 2,621,105 (28.10.49; 9.12.52). L. C. Bearer and G. Hill, assrs to Phillips Petroleum Co. High temp solid material-fluid contact apparatus and method of operation.

U.S.P. 2,621,113 (24.9.43; 9.12.52). J. G. Alther, assr to Universal Oil Products Co. Apparatus for cat conversion of hydrocarbons.

U.S.P. 2,621,148 (31.12.47; 9.12.52). J. W. Barker, assr to Houdry Process Corpn. A cyclic hydrocarbon conversion process in which solid contact material gravitates through separate conversion and regeneration zones, and in which elevated pressure exists at the upper end of the conversion zone, and follows a specified path between a conversion zone and first and second regeneration zones.

U.S.P. 2,623,020 (10.12.49; 23.12.52). G. R. Gilbert, assr to Standard Oil Development Co. The method of preparing a base for hydrocarbon conversion cat which comprises dissolving zinc oxide in an aq soln of an aluminium salt of a strong mineral acid, adding a basic precipitant to the resultant soln, separating and washing the precipitate.

U.S.P. 2,623,021 (2.9.48; 23.12.52). S. B. Sweetser, F. R. Russell, and E. R. Bucker, assrs to Standard Oil Development Co. Formation of an attrition-resistant Fischer–Tropsch cat.

U.S.P. 2,623,022 (16.11.48; 23.12.52). D. R. McAdams, assr to Standard Oil Development Co. Preparation of a sintered hydrocarbon-synthesis cat bed.

U.S.P. 2,623,860 (12.4.51; 30.12.52). V. Haensel, assr to Universal Oil Products Co. A method of manufacturing a cat which comprises impregnating a porous support with a soln of a platinum compound in contact with a basic ammonium salt or an organic amino compound, and calcining the thus impregnated support. D. A. R.

Hydrogenation

1756. Patents. U.S.P. 2,620,293 (19.12.49; 2.12.52). R. W. Blue and C. J. Engle, assrs to Phillips Petroleum Co. A process for the conversion of a hydrocarbon oil residuum to a hydrocarbon cracking stock boiling in a range lower than that of the residuum.

U.S.P. 2,620,356 (17.7.43; 2.12.52). J. C. Munday, assr to Standard Oil Development Co. A continuous method for producing a primary aromatic amine from the corresponding mono-nitro-mono-cyclic aromatic compound, by hydrogenation in the presence of an active hydrogenation cat which is a sulphide of molybdenum or tungsten.

U.S.P. 2,620,346 (24.9.48; 2.12.52). L. C. Rubin and H. G. McGrath, assrs to M. W. Kellogg Co. The cat hydrogenation of carbon monoxide for the production of hydrocarbons, oxygenated hydrocarbons, and the like.

U.S.P. 2,620,347 (Germany 7.8.49, 2.12.52). W. Rottig, assr to Ruhrchemie A.G. Method for the activation of precipitated iron cat for use in the cat hydrogenation of carbon monoxide with an increased formation of high mol hydrocarbons and a reduced methane formation.

U.S.P. 2,620,348 (20.7.50; 2.12.52). W. G. May and S. B. Sweetser, assrs to Standard Oil Development Co. Hydrocarbon synthesis process with two-stage coke gasification.

U.S.P. 2,622,111 (29.11.45; 16.12.52). V. Haensel, assr to Universal Oil Products Co. A process for hydrogenating benzene which comprises subjecting benzene to contact at a temp of from about atm to about 400° F with hydrogen and a cat prepared by treating silica with a soln of a normally solid aromatic hydrocarbon and subsequently compositing platinum therewith.

U.S.P. 2,623,078 (G.B. 19.8.49; 23.12.52). T. Bewley and P. L. Bramwyche, assrs to Distillers Co. A process for the hydrogenation of reducible organic compounds which comprises treating the compound with hydrogen in the presence of a cat to form a cat containing the corresponding metal.

U.S.P. 2,623,893 (9.11.48; 30.12.52). B. I. Kaufman, assr to M. W. Kellogg Co. Hydrogenation of oxygenated organic compounds. D. A. R.

Polymerization

1757. Patents. U.S.P. 2,620,364 (14.4.48; 2.12.52). R. C. Krug, assr to Atlantic Refining Co. A method of polymerizing aliphatic mono-olefins containing from 3 to 10 carbon atoms, which comprises contacting the mono-olefin with a boron phosphate cat at a temp between 150° and 600° F at a space velocity between 0·5 and 3 vol of mono-olefin per vol of cat per hr, and recovering the resulting olefin polymers.

U.S.P. 2,621,170 (29.12.47; 9.12.52). F. W. Banes and J. D. Garber, assrs to Standard Oil Development Co. A fibre of a resinous copolymer soluble in nitro-

methane and containing 65 to 85 wt % of combined acrylonitrile, 35 to 15 wt % of combined *iso*butylene and 0·05 to 3 wt % of combined sulphur, said fibre being characterized by a tensile strength of 10,000 to 100,000 p.s.i. and the copolymer being characterized by an extrusion temp between 300° and 400° F and by a specified intrinsic viscosity.

U.S.P. 2,621,171 (31.10.49; 9.12.52). G. D. Jones, assr to Dow Chemical Co. In a process for polymerizing α-methyl stryene to form a solid polymer having a mol. wt. corresponding to an intrinsic viscosity in toluene greater than 0·4, the improvement which consists in polymerizing the α-methyl styrene at a temp between 0° and 30° C while in admixture with finely divided metallic sodium and in the substantial absence of an inert liq medium.

U.S.P. 2,621,188 (13.11.51; 9.12.52). K. L. Kreuz, assr to Texas Co. A process for preparing thiophene and substituted thiophenes which comprises pyrolysing at a temp of 500° to 1500° F a substituted trithiane compound in which at least 2 of the carbon atoms contain an aliphatic radical selected from the group consisting of alkyl, alkenyl, and aralkyl groups.

U.S.P. 2,622,113 (31.3.48; 16.12.52). G. L. Hervert, assr to Universal Oil Products Co. A process for the production of olefinic hydrocarbons containing from *ca* 12 to *ca* 15 carbon atoms per mol which comprises subjecting monomeric olefinic hydrocarbon fractions to polymerization.

U.S.P. 2,623,023 (28.7.51; 23.12.52). J. E. Koroly, assr to Rohm & Haas Co. A process for preparing expanded, cellular, resinous products.

U.S.P. 2,623,024 (31.5.51; 23.12.52). B. C. Barton, assr to United States Rubber Co. A method of making a mixture of rubber and carbon black.

U.S.P. 2,623,025 (11.2.49; 23.12.52). W. C. Dearing and A. M. Howald, assrs to Libbey–Owens–Ford Glass Co. A method of stabilizing a polymerizable unsaturated polyhydric alcohol–polybasic acid polyester composition, containing a cat of the class consisting of organic peroxides and organic ozonides.

U.S.P. 2,623,023 (29.12.48; 23.12.52). F. W. Banes and E. Arundale, assrs to Standard Oil Development Co. A 2-stage process for producing rubber-like polymers from butadiene and acrylonitrile.

U.S.P. 2,623,034 (12.7.47; 23.12.52). P. J. Flory and F. S. Leutner, assrs to Wingfoot Corpn. A crystalline superpolymer to tetramethylene *iso*phthalate.

U.S.P. 2,623,035 (12.8.50; 23.12.52). J. W. Schappel, assr to American Viscose Corpn. An addition product of 1 mol of urea and 1 to 2 mol of a monomeric sulphonyl compound having from 1 to 2 intermediate sulphonyl radicals, each of said radicals being linked to a terminal group selected from the class consisting of vinyl and monohydrocarbon-substituted vinyl.

U.S.P. 2,623,863 (29.3.51; 30.12.50). J. R. Dieckmann, L. W. Muscott, and A. F. Roche, assrs to Dow Chemical Co. Process for making thermoplastic compositions from resinous polymers of monovinyl aromatic hydrocarbons and rubber. D. A. R.

Alkylation

1758. Patents. U.S.P. 2,621,199 (30.4.51; 9.12.52). O. G. Gilbert, assr to Ethyl Corpn. In the process of alkylating lead in a sodium–lead alloy by reacting with an alkyl chloride at temp below 100° C, conducting the reaction in the presence of a small amount of free or combined iodine or bromine causes the simultaneously produced lead to form as non-coalescing, easily stirred, dense particles that keep the reaction mass from becoming too voluminous.

U.S.P. 2,621,200 (16.6.51; 9.12.52). A. J. Kolka and I. T. Krohn, assrs to Ethyl Corpn. The process of forming hydrocarbon lead compounds, comprising dissolving in a reaction medium comprising essentially liq ammonia, alkali, or alkaline earth metal, and reacting the resulting soln with proper hydrocarbon groups in question, and having a negative radical which reacts with the reducing metal. D. A. R.

Isomerization

1759. Patent. U.S.P. 2,623,076 (31.3.49; 23.12.52). A. K. Roebuck and B. L. Evering, assrs to Standard Oil Co. A process for isomerizing with sulphuric acid a saturated hydrocarbon containing isomerization-inhibiting impurities. D. A. R.

Chemical and Physical Refining

1760. Patents. U.S.P. 2,620,362 (7.7.48; 2.12.52). A. B. Stiles, assr to E.I. du Pont de Nemours and Co. A process for the removal of sulphur contaminants from a hydrocarbon.

U.S.P. 2,620,363 (29.9.50; 2.12.52). H. J. Hibshman, assr to Standard Oil Development Co. A process for the segregation of normal paraffins from *iso*paraffins.

U.S.P. 2,621,032 (Germany 1.10.48; 9.12.52). E. Schellenburg, assr to Koppers Co. Gas scrubber provided with rotary spraying device and indicator.

U.S.P. 2,621,147 (22.9.51; 9.12.52). J. C. D. Oosterhout and T. C. Roddy, assrs to Texas Co. The method of treating hydrocarbon oils containing mercaptan sulphur to effect simultaneous sweetening thereof and stabilization against oxidn.

U.S.P. 2,623,005 (14.4.49; 23.12.52). W. N. Axe and A. N. DeVault, assrs to Phillips Petroleum Co. Propane fractionation of lub oil stocks.

U.S.P. 2,623,006 (28.10.48; 23.12.52). J. McAfee, assr to Gulf Oil Corpn. Desulphurization of a hydrocarbon oil.

U.S.P. 2,623,007 (30.8.49; 23.12.52). J. W. Myers, assr to Phillips Petroleum Co. An improvement in a process for the cat desulphurization of a hydrocarbon fraction in the presence of a desulphurization cat consisting essentially of 30 to 50% by weight chromia, 32 to 60% by weight alumina, and 4 to 18% by weight beryllia.

U.S.P. 2,623,008 (20.12.49; 23.12.52). L. D. Kleiss, assr to Phillips Petroleum Co. A process for sweetening a sour hydrocarbon fraction. D. A. R.

Special Processes

1761. Preparation of crude synthesis gas from hydrocarbons. H. A. Tuttle. *Chem. Engng Progr.*, June 1952, **48** (6), 272–5.—Economic reasons for using hydrocarbon gases as a source for ammonia synthesis raw gas are considered. Thermal cracking is briefly discussed, reaction rates are given, and limitations and disadvantages are indicated. Cat cracking is considered in detail, with emphasis on the function and design of the main items of equipment. The correlation of these and other auxiliary equipment is explained, and their relationship indicated by a flow diagram.
J. G. H.

1762. Patents. U.S.P. 2,620,262 (26.8.49; 2.12.52). K. L. Hujsak, M. B. Kratzer, and R. Mungen, assrs to Stanolind Oil and Gas Co. System for synthesis from H_2 and C'O with fluidized cat.

U.S.P. 2,620,895 (26.3.49; 9.12.52). N. C. Turner, assr to Hudson Engineering Corpn. Separation and dehydration of heavy hydrocarbons from a gaseous mixture.

U.S.P. 2,621,153 (31.3.47; 9.12.52). R. H. M. Meyer and F. F. van der Plas, assrs to Shell Development Co. A process for producing 1 : 1 : 2-trichlorocthane which involves reacting ethylene dichloride and chlorine in the vapour phase.

U.S.P. 2,621,202 (France 19.9.47; 9.12.52). E. Peukert and F. Hilberath. A process for the synthesis of alcohols from a synthesis gas containing carbon monoxide and hydrogen.

U.S.P. 2,621,203 (4.10.47; 9.12.52). J. Q. Cope, assr to California Research Corpn. The method of fractionating the crude reaction product obtained by subjecting a charge comprising hydrogen and carbon monoxide to a cat synthesis adapted to induce the formation of hydrocarbons and oxygenated organic compounds.

U.S.P. 2,621,204 (26.1.50; 9.12.52). A. F. MacLean and D. E. Pickart, assrs to Celanese Corpn of America. Steps in process for the production of acrylonitrile, whereby a mixture of hydrogen cyanide and acetylene is passed through an aq soln of a cat.

U.S.P. 2,622,062 (2.6.49; 16.12.52). J. W. Putt, J. O. Smith, Jr., and J. O. McLean, assrs to Tide Water Associated Oil Co. Apparatus for automatic collection of a plurality of liq fractions.

U.S.P. 2,622,088 (29.6.50; 16.12.52). C. J. Thomas, assr to Phillips Petroleum Co. A method for the production and recovery of ethylene oxide.

U.S.P. 2,622,089 (5.9.47; 16.12.52). B. J. Mayland, assr to Phillips Petroleum Co. A process for the manufacture of synthesis gas containing a mol ratio of hydrogen to carbon monoxide of 2 : 1.

U.S.P. 2,622,093 (23.5.51; 16.12.52). S. M. Blitzer and O. M. Brown, assrs to Ethyl Corpn. Process for the recovery of a tetra-alkyl lead from a dry reaction mass having therein appreciable tetra-alkyl lead not discernible as a separate phase.

U.S.P. 2,622,114 (31.12.48; 16.12.52). S. C. Carney, assr to Phillips Petroleum Co. The method of separating a mixture which melts over a range of temp into a higher-melting fraction and a lower-melting fraction.

U.S.P. 2,622,115 (23.5.49; 16.12.52). S. C. Carney, assr to Phillips Petroleum Co. Separation of eutectic-forming mixtures by crystallization methods.

U.S.P. 2,622,968 (13.11.48; 23.12.52). J. W. Packie, assr to Standard Oil Development Co. Consists of a step-type plate member transversely positioned in a vessel, an angular member secured to the wall in spaced relation to the plate, the member with the vessel walls forming an enclosed chamber leaving a restricted inlet orifice adjacent to the plate.

U.S.P. 2,622,970 (3.7.48; 23.12.52). H. Z. Martin, assr to Standard Oil Development Co. An apparatus for promoting the synthesis of hydrocarbons from synthesis gas containing hydrogen and carbon monoxide.

U.S.P. 2,622,973 (2.10.45; 23.12.52). F. T. Barr, assr to Standard Oil Development Co. The process of converting solid carbonaceous materials into valuable volatile fuels by means of heat generated by partial combustion of said carbonaceous materials in a fluidized bed of solids.

U.S.P. 2,623,010 (24.9.49; 23.12.52). A. H. Schutte, assr to Lummus Co. Oil coker.

U.S.P. 2,623,069 (29.9.50; 23.12.52). J. B. Wilkes, assr to California Research Corpn. A method for producing 4-chlorobutane-1-sulphonyl chloride which comprises reacting not more than 3 mol of chlorine with 1 mol of thiophane or thiophane sulphoxide in the presence of a molar excess of water and at a temp from *ca* 20° to *ca* 90° F.

U.S.P. 2,623,071 (13.5.48; 23.12.52). A. F. Bowles, assr to Synor Research Laboratories Inc. A process for the manufacture of alkyl and aralkyl-substituted *cyclo*pentenones.

U.S.P. 2,623,072 (27.9.46; 23.12.52). G. C. Ray, assr to Phillips Petroleum Co. A process for the manufacture of *cyclo*pentanone by the dehydrogenation of *cyclo*pentanol.

U.S.P. 2,623,073 (21.12.46; 23.12.52). W. G. Toland, assr to California Research Corpn. Preparation of unsaturated ketones.

U.S.P. 2,623,074 (19.8.48; 23.12.52). W. F. Ratcliff, assr to Standard Oil Development Co. Production of alcohols and gasoline by the OXO process.

U.S.P. 2,623,811 (16.11.49; 30.12.52). I. Williams, assr to J. M. Huber Corpn. A process for producing carbon black and valuable by-product gases by the thermal decomposition of hydrocarbons that decompose with the absorption of heat.

U.S.P. 2,623,842 (5.1.48; 30.12.52). S. P. Robinson, assr to Phillips Petroleum Co. A process for effecting conversion of hydrocarbons in direct heat exchange with hot gravitating pebbles.

U.S.P. 2,623,906 (16.6.48; 30.12.52). W. F. Gresham, assr to E.I. du Pont de Nemours and Co. A process for the synthesis of organic oxygen-containing compounds.

U.S.P. 2,623,912 (19.12.49; 30.12.52). F. M. Smith, assr to Phillips Petroleum Co. A process for the production of partially hydrogenated polycyclic organic compound. D. A. R.

Ger.P. 871,145, 12.2.53. G. Müller, assr to Metallges. A.G. Activated charcoal production.

Ger.P. 871,445, 12.2.53. P. Nashan, assr to Bergbau-A.G. Process for oxidn of methane and its homologues to formaldehyde.

Ger.P. 871,752, 12.2.53. O. von Schickh, assr to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. "in dissolution"). Method for producing nitro halogen carboxylic acids and their derivatives.

Ger.P. 871,446, 12.2.53. G. Bracht, B. Jüttner, and O. Regel, assrs to Bergwerksverband zur Verwertung von Schutzrechten der Kohlentechnik G.m.b.H., Dortmund-Eving. Method for producing benzene carboxylic acids. (Addn. to Pat. 854,510.)

Ger.P. 871,754, 12.2.53. O. Grosskinsky, B. Jüttner, and E. Thürauf, assrs to Bergwerksverband zur Verwertung von Schutzrechten der Kohlentechnik G.m.b.H., Dortmund-Eving. Process for obtaining benzene carboxylic acids or their esters.

Ger.P. 871,755, 12.2.53. K. W. Schneider and H. Feichtinger, assrs to Ruhrchemie A.G., Oberhausen-Holten. Method for producing carboxylic acid amides and carboxylic acids.

Ger.P. 871,756, 12.2.53. W. Herrmann and K. Windisch, assrs to Farbwerke Höchst, formerly Meister Lucius & Brüning, Frankfurt (Main)-Höchst. Method for producing thiosemicarbazides.

Ger.P. 871,148, 12.2.53. E. Grünthal and L. Mannes, assrs to Henkel & Cie G.m.b.H., Düsseldorf-Holthausen. Method for producing practically neutral, unsaturated fatty acid fat alcohol esters from sperm oil.

Ger.P. 871,447, 12.2.53. Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. "in dissolution"), Ludwigshafen (Rhein). Method for producing higher-mol aliphatic mercaptans.

BrennstChemie, 1953, **34** (5–6). R. T.

Metering and Control

1763. It's easy to determine NPSH. D. R. Rankin. *Petrol. Refin.*, 1953, **32** (6), 129–32.—Descriptions of the method of calculating the net positive suction head for different relative positions of tank and pump. R. D. S.

1764. Volumetric displacement meters for bulk measurement. R. E. Rawsthorne. *Inst. Weights and Measures Administration. Supp. to Monthly Review*, May 1953.—A glossary of terms and definitions is given, and the relative position of volumetric displacement meters in the U.K. and the U.S.A., and standards used, are described. The following types of piston meters are described, illustrated, and discussed: nutating piston, reciprocating piston, planetary piston, sliding or rotating vanes, gear or lobed impeller. The primary standard of measurement and meter testing as applied to tank trucks, open type atm vessels, the master meter, weight, or gravimetric method, and the weigh tank are described and discussed. W. H. C.

1765. Patents. U.S.P. 2,621,516 (12.6.48; 16.12.52). S. V. Zavoico, assr to Bowser Inc. In a metering system comprising a flow line and means for applying fluid under pressure to said line, the combination of which comprises a meter in said line, a power means, and power transmission means.

U.S.P. 2,622,442 (10.6.49; 23.12.52). D. R. de Boisblanc and L. M. Oberlin, assrs to Phillips Petroleum Co. Apparatus for measuring liq levels. D. A. R.

PRODUCTS

Chemistry and Physics

1766. Some physical properties of petroleum at high pressures. E. Kuss. *Erdöl u. Kohle*, 1953, **6**, 266–70.—Equipment of high pressure laboratory is described and illustrated. Visc is one of properties most affected by high pressure, effects of which thereon vary considerably with product tested. Visc–pressure coeff (a) was determined for several pure substances, at 2000 atm; a is large for cyclic compounds, in straight chain compounds it increases with chain length; it is very temp-dependent. In case of lub oils visc–temp coeff gives some indication of visc behaviour under pressure. Plot of d against an. pt. (° Abs) $\times$ b (latter from equation $1/a = ct + b$) for 40 lub oils gives curve which can serve for rough assessment of visc–pressure behaviour. Effect of oil at 10,000 atm on steel plates was examined; sudden decompression causes pitting. V. B.

Analysis and Testing

1767. Critical comparison of the capabilities of some grease consistometers. G. H. Göttner and G. R. Schultze. *Erdöl u. Kohle*, 1953, **6**, 200–3.—5 grease testing apparatuses (Richardson penetrometer according to ASTM D 217–48; and 4 German types, viz.: Deutschen Gasolin AG consistometer; Wefelscheid's; Kesternich's; and Höppler's are considered). The sources of error in each instrument are discussed. Tests on 5 greases (2 Ca, 2 Na, 1 Li; drop pt 87° to 180° C, ASTM worked pen at 25° C 240–301) in 4 of the instruments (Kesternich's excluded) showed that arrangement of greases in order of consistency varied from instrument to instrument. Hardness values (g/cm²) corresponding to penetration values (at various d) measured on the Richardson instrument are tabulated. V. B.

1768. Procedure for use of electronic digital computers in calculating flash vaporization hydrocarbon equilibrium. H. H. Rachford and J. D. Rice. *J. Petrol. Tech.*, Oct. 1952, **4** (10), 19.—For machine calculation the problem may have to be formulated differently from the case of manual solution. A method is presented for dealing with the solution of the implicit equation $F(x, y_1, y_2, \ldots y_n) = 0$, where the root, x_0, is to be found for a set of $y_1 \ldots y_n$. Given the composition of a hydrocarbon mixture and appropriate values of the equilibrium ratios, K, the problem is to find the phase ratio and compositions in a closed system. This can be presented in the form indicated above, and on an IBM 604 Electronic Calculater a 12-component flash can be computed to 6 significant figures with the results punched on tabulating cards in 2·4 min. The requirements are that, in the region studied, the function shall have no discontinuities across the axis, and only one root, and that the sign of the derivative shall be known for the root sought. G. D. H.

1769. Learning how to use dimensional analysis. I. H. Silberberg and J. J. McKetta. *Petrol. Refin.*, 1953, **32** (6), 101–3.—Pt III explains Rayleigh's method of analysis, giving dimensionless groups, and illustrates it with simple examples on fluid flow and a pendulum. R. D. S.

1770. Gasoline analysis by infra-red spectrometry. J. Favre. *Rev. Inst. franç. Pétrole*, 1953, **8**, 183–92.—Perkin–Elmer spectrograph used in range 7·5–15 μ. Gasoline fractionated (30 plate col) into 8 cuts + residue, cuts (5) to 95° C subjected to direct analysis, remainder first percolated through Si gel to remove aromatics. Results given for 4 gasolines (S.R. from Iran, Arabian, and Tunisian crudes; French C.H.G.) in terms of individual compounds identified in 30°–120° C cuts; for higher fractions individual identification of hydrocarbons is not possible, but method is described for estimating primary, secondary, tertiary, and quaternary C. Procedure is also described (involving acid washing) for examination of olefin-containing (cat cracked and reformed) material. V. B.

1771. Apparatus for testing protective coatings of pipelines. R. Henzi. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (2), 39–40. (From monthly bulletin Nov. 1951, Swiss Gas and Water Specialists' Soc., Zurich.)—The description of a Swiss elec device for fault location in tank and pipe insulations and roofing compositions is supported by a schematic diagram and an illustration of operating technique. R. T.

1772. Patents. U.S.P. 2,622,441 (15.3.47; 23.12.52). F. L. Richardson and P. R. Cronin, assrs to Sperry Corpn. A multi-cyl engine analysing device comprising a cathode-ray tube.

U.S.P. 2,623,057 (20.4.48; 23.12.52). J. H. Arnold, assr to Hydrocarbon Research Inc. Hydrocarbon synthesis. D. A. R.

Crude Oil

1773. Study of some Middle East Crudes, Kuwait–Iraq–Qatar. I. Kuwait crude. Anon. *Rev. Inst. franç. Pétrole*, 1953, **8**, 223–31.—Results of pilot plant evaluation. Crude (d_4^{15} 0·865, S 1·7%, wax 59%, asphaltenes 2%) atm and vac fractionated (15 plate col, R.F.R. 5, max bottom temp 320° C) into 67 1% cuts which were tested and blended. Typical result is (wt %): gas 1·2, gasoline (210° C) 26·8 (O.N. Motor 36 clear, + 0·05% T.E.L. 55), kerosine (200–250) 2·6, gas oil (220–350) 17·6 (cetane 60). V. B.

1774. Chemical composition of various crude oils. G. J. F. Stijntjes, H. I. Waterman, and J. B. Westerdijk. *Riv. Combust.*, 1953, **7**, 280–9.—The chemical composition of fractions of crude oils from the U.S.A., Indonesia, Mexico, Rumania, Venezuela, and Iran is determined by graphical statistical methods. Results are tabulated and graphed. The degree of branching was calculated both from the Verdet constant and from surface tension. The hydrocarbons in the oils investigated are not strongly branched. (Authors' Summary.)

1775. Patent. U.S.P. 2,620,043 (27.8.48; 2.12.52). E. R. Williams, assr to F. L. Murdock. Apparatus for treating petroleum having water emulsified therein, by upward bubbling of the emulsion through a salt brine. D. A. R.

Gas

1776. Natural gas in the province of Alberta, Canada. J. F. Dougherty, A. Folger, H. R. Lowe, J. Meyer, and E. G. Trostel. *J. Petrol. Tech.*, Oct., 1952, **4** (10), *AIMME Tech. Paper No.* 3398, 241–60.—Natural gas in commercial quantities in Alberta was first found at Medicine Hat in 1890. Since then, 187 localities have proved capable of gas production, 73% of these having been found since 1945. 60 fields are now producing, 22 being non-associated gas accumulations. For 104 fields estimated reserves at the beginning of 1952 were $11{\cdot}7 \times 10^{12}$ cu. ft., proved and probable. 5 fields have over 1×10^{12} cu. ft. each. 56% of the reserves are in Cretaceous beds, 30% in the Mississippian, and 10% in the Devonian. East of the Alberta syncline, beds of Jurassic through Mississippian age form wedge-out belts many hundreds of miles long. For 20,000 sq. miles on the Peace River ridge the Devonian rests on Pre-Cambrian.

Most of the clastic sediments were derived from the west. In Upper Devonian times there was widespread growth of reefs. In the isolated Peace River basin there is thick marine Triassic. Much of the thick Cretaceous was the result of marine transgression, but there were continental deposits, especially in the upper Blairmore.

The Madison reservoirs of the foothills belt are structurally controlled; the oil at Joseph Lake and Excelsior are localized by structure, and the same is true of a few basal Cretaceous and Viking gas accumulations in the central and southern Alberta plains. Stratigraphical and combination reservoirs are dominant in the central and southern Alberta plains area, with the second type probably most common, but definite information is lacking. Devonian reservoirs appear to have appreciable water-drive, but not Mississippian. Cretaceous reservoirs are dominated by the depletion type recovery mechanism.

77% of the localities with measurable volumes of gas seem not to be associated with oil. Most of the 316 localities with measurable amounts of gas have been found in searching for oil. When permission is given to export gas, the rate of gas discovery should increase.

Pincher Creek is a strongly asymmetrical fold of Rundle limestone in a complex of thrust sheets. The gas–water contact is placed at −8200 ft. Reserves to a terminal pressure of 700 p.s.i.a. are placed at $2{\cdot}29 \times 10^{12}$ cu. ft.

Leduc–Woodbend is a large biohermal reef with Devonian and Cretaceous beds arched over it. The Blairmore has multiple gas pays. The major gas reserve is in the Nisku dolomite oil zone. The D_3 has a large gas cap.

Viking–Kinsella has 497,000 acres of gas at an average depth of 2100 ft. There is up-dip pinch-out. At Cessford gas has been found in the Viking, Blairmore, and Sunburst sands in an area some 25 miles by 15 miles, dominated by stratigraphic control, but modified by local structure. Structure is relatively unimportant at Medicine Hat.

At Whitelaw, in the Peace River area, there is a large volume of gas in the Trias and Lower Cretaceous. This is on an anticline, and there may be a porosity pinch-out to the northeast.

New gas reserves may be found in pinch-outs in the Devonian, Mississippian, and Cretaceous on the east flank of the Alberta syncline. The central Alberta plains area has many low-relief northwest–southeast regional folds.

In 1950 Alberta's gas consumption was about 48×10^9 cu. ft., treble the 1940 figure. Requirements are estimated at 99×10^9 cu. ft. in 1960 and 131×10^9 cu. ft. in 1980. In 1950 applications to export gas were not granted, and further applications are being considered. It appears that there is a surplus of gas beyond expected provincial requirements.

Many details are presented in tabular form, and in addition there are a map, stratigraphical column, and several graphs. G. D. H.

1777. Phase and volumetric behaviour of natural gases at low temperatures. T. L. Gore, P. C. Davis, and F. Kurata. *J. Petrol. Tech.*, Nov. 1952, **4** (11), *AIMME Tech. Paper No.* 3438, 279–84.—Dist at low temp to recover ethane and ethylene from natural or refinery gases, or excess nitrogen from natural gas calls for the use of low temp. More data are required for problems such as these.

In the experiments a dew-point bubble-point technique was used in a glass cell of about 12 ml volume in a pentane bath within a glass Dewar flask. Liq nitrogen was the cooling agent.

2 gases were used. For one, 14 isotherms were determined between −40° and −200° F. The other, obtained by adding methane to the first, was studied at 7 temp between −80° and −200° F.

Plots of the isotherms were made, and from these cross-plots, giving the phase envelopes, and the critical points. The steepness of the isotherms at low liq percentages makes the accurate fixing of dew points difficult. The volumetric behaviour of the gases is shown in terms of the compressibility factor and the pseudo-reduced temp and pressure. Pressure ranged up to 1200 p.s.i. G. D. H.

1778. Can the refiner use more light ends? D. P. Barnard, J. H. Forrester, and R. A. Steel. *Petrol. Refin.*, 1953, **32** (6), 135–8.—A discussion of the supply and demand position of C_4 hydrocarbons in the U.S. both now and in 2 years' time. Only 60% of the total potential butane production is utilized in saleable products, 331 million b.d. being wasted. and this is expected to rise by a further 12 million b.d. by 1955, despite increases and changes in refining capacity. The author considers in detail its use in motor gasoline, but does not expect any increase in consumption unless special equipment is devised. R. D. S.

1779. Is L.P.G. a cheap motor fuel? F. C. Burk, E. S. Black, and L. J. Test. *Petrol. Refin.*, 1953, **32** (6), 119–21.—Reports the results obtained from a comparative economic test on the use of diesel fuel, gasoline, and L.P.G. in a city bus fleet over a period of 2 years. The list above is in order of increasing overall cost, but if L.P.G. were available more readily than in the test locale, it would be more economical in use than gasoline. R. D. S.

1780. Calculating properties of gases and gas mixtures. I. Granet. *Petrol. Refin.*, 1953, **32** (6), 125–8.—A review of the methods used to calculate visc and thermal conductivity of gases. Critical properties of 42 gases and charts for use with the method of corresponding states are given, since this is the most generally applicable method, at present, which permits calculation for different conditions of temp and pressure. R. D. S.

1780a. Patents. U.S.P. 2,623,815 (23.11.46; 30.12.52). B. E. Roetheli and C. E. Hemminger, assrs to Standard Oil Development Co. Apparatus for gasifying carbonaceous fuel.

U.S.P. 2,623,817 (13.4.46; 30.12.52). W. K. Lewis, assr to Standard Oil Development Co. A process for preparing a fuel gas from solid carbonaceous material which comprises reacting the carbonaceous material with a gasiform material which reacts endothermically with carbonaceous material to generate fuel gas rich in CO.

D. A. R.

Engine Fuels

1781. Some effects of fuel structure, tetra-ethyl lead, and engine deposits on precombustion reactions in a firing engine. W. Cornelius and J. D. Caplan. *S.A.E. quart. Trans.*, July 1952, **6** (3), 488–510.—Recent findings in a 30-year study at the G.M. labs of the cause and prevention of knock in automotive and aircraft engines are presented. A single-cyl engine of the high-vol G.M. passenger car type was used and, duplicating conditions in highway driving, engine firing conditions were directly observed and recorded on supersensitive instruments through a transparent quartz window in the engine cyl head. Cool flame radiation measurements indicated the occurrence of one cool flame, and in some instances 2 successive cool flames, under the engine operating conditions employed. T.E.L. appeared to eliminate the second cool flame radiations, but diminished only slightly the intensity of the first cool flame radiations. Cyl pressure and radiation measurements indicate that precombustion reactions take place in current engines on the road (operating with mixture temp below 140° F) after ignition during combustion rather than before ignition during the compression stroke. Consequently, no losses in power and thermal efficiency of current engines should occur on the road as a result of cyl pressure development due to precombustion reactions taking place during the compression stroke and prior to ignition. J. G. H.

1782. Early combustion reactions in engine operation. E. B. Rifkin, C. Walcutt, and G. W. Betger. *S.A.E. quart. Trans.*, July 1952, **6** (3), 472–87.—Results are presented of a study of precombustion reactions—chemical changes occurring in the fuel–air mixture ahead of the flame front—based on thermodynamic analysis of engine data, obtained in an ASTM single-cyl knock-test engine, operated at a fixed C.R. in conjunction with balanced pressure equipment. Preliminary thermodynamic analysis indicated that simplification is computation of the heat of precombustion reactions would be possible if ignition timing were so retarded that the normal flame would be initiated after completion of the precombustion reaction. Tests were accordingly run both at normal ignition timing and with the retarded spark. From the data so obtained, it was concluded that the liberation of heat during precombustion period may account for 10% of the total heat of combustion of the fuel, as compared with 27% with different fuels and under different engine operating conditions. The addition of T.E.L. does not affect the rate of liberation of heat over most of the precombustion period, but it is effective in either postponing or eliminating the onset of knock, while increasing the O.N. of a 2-component hydrocarbon blend by changing the relative concentrations of the two constituents, decreases the rate of liberation of heat over most of the precombustion period. Within each fuel-type group, increase in O.N. lowers the total heat of the precombustion reaction, but the magnitude of this heat for each fuel is not specificially related to the O.N. J. G. H.

1783. Technical and economic considerations on the use of boiler fuel in marine diesel engines. E. Cotti and A. Mari. *Riv. Combust.*, 1953, **7**, 290–315.—Differences in diesel engine operations when changing from diesel to boiler fuel are discussed, and

features required for reliable operation on heavy oil are outlined. The financial advantage of using heavy oil instead of diesel oil is examined. (Authors' Summary.)

1784. Studies on the spontaneous ignition of fuels injected into a hot air stream. III—Effect of chemical factors upon the ignition delay of kerosine–air mixtures. B. P. Mullins. *Fuel, Lond.*, July 1953, **32**, 327–42.—This paper records the ignition delay measurements made in the standard apparatus by the continuous flow method of test described in Pt 1 of this series, with Pool burning oil containing up to 5% by vol of various additives, which include diethyl ether, *tert*butyl hydroperoxide, and acetaldehyde, or kerosine blended in various proportions with ethyl nitrate, ethyl nitrite, or amyl nitrite. It discusses: (*a*) the effect of chemical changes in the composition of the air stream (vitiation), and (*b*) the effect of fuel additives upon the ignition delay of kerosine–air mixtures at atm pressure and temp lying between 600° and 1100° C. Ethyl nitrate was the only additive at 5% concn causing a large reduction in ignition delay of the parent hydrocarbon. W. H. C.

1785. Studies on the spontaneous ignition of fuels injected into a hot air stream. IV—Ignition delay measurements on some gaseous fuels at atmospheric and reduced static pressures. B. P. Mullins. *Fuel, Lond.*, July 1953, **32**, 343–62.—Using the apparatus and method described in the previous abstract (Abs. **1784**) ignition delay measurements have been made at air temp between 600° and 1000° C and within the static pressure range 0·3 and 1·0 atm on carbon monoxide, methane, ethane, Calorgas, Butagas, acetylene, and hydrogen. The effect of reduction in static presssure is generally to increase the ignition delay, although with some fuels the pressure effect becomes reversed below a certain pressure. W. H. C.

1786. Studies on the spontaneous ignition of fuels injected into a hot air stream. V—Ignition delay measurements on hydrocarbons. B. P. Mullins. *Fuel, Lond.*, July 1953, **42**, 363–79.—Results are recorded of ignition delay measurements on a number of pure hydrocarbons and petroleum products: paraffins, aromatic and unsaturated hydrocarbons, naphthalene derivatives, *cyclo*-compounds, and gas-turbine fuels. Although the ignition delay *v* temp curves of the petroleum products all lie close together, considerable differences in the positions and slopes of the curves of various single hydrocarbon compounds were found. W. H. C.

1787. Oil industry finds fuel additives can help in controlling pre-ignition. R. J. Greenshields. *Oil Gas J.*, 29.6.53, **52** (8), 71.—The tendency of combustion-chamber deposits to glow and cause surface ignition of charge and ability of fuels to withstand ignition by hot surfaces are discussed. The cat influence of metal salts which causes rapid oxidn of carbonaceous materials can be hindered by addition of suitable fuel additives. G. A. C.

1788. Pre-ignition—does it provide roadblock to greater efficiency in fuel utilization? J. R. Sabina, J. J. Mikita, and M. H. Campbell. *Oil Gas J.*, 29.6.53, **52** (8), 66.—Various types of combustion phenomena are defined and discussed. The role of combustion-chamber deposits in pre-ignition test methods, use of additives to reduce deposit glow, engine and laboratory studies of fuel pre-ignition are considered. G. A. C.

1789. Patents. U.S.P. 2,622,018 (19.10.49; 16.12.52). R. V. White and P. S. Landis, assrs to Socony-Vacuum Oil Co. A motor fuel which comprises a gasoline containing between about 0·0001 and about 1% by wt, of the reaction product obtained by reacting, with the formation of water of condensation, at least one aliphatic monocarboxylic acid with a polyalkylene-polyamine.

U.S.P. 2,622,971 (17.12.47; 23.12.52). G. H. Denison, assr to California Research Corpn. A spark ignition engine fuel comprising a substantially gum-free hydrocarbon fuel boiling in the gasoline boiling range and having an F-2 method octane rating not less than 100 numbers and containing 0·001 to 0·5% by wt of an additive which will improve the rich mixture anti-knock value of the fuel and is an N-methylaminophenol or a nuclear C_1 to C_4 alkyl homologue thereof. D. A. R.

Gas Oil and Fuel Oil

1790. Patent. U.S.P. 2,621,719 (3.5.47; 16.12.52). B. G. Eaton and W. H. Peters, assrs to Curtiss-Wright Corpn. Constant centre of gravity liq fuel supply system. D. A. R.

Lubricants

1791. Laboratory evaluation of lubricating greases. E. G. Ellis. *Sci. Lubric.*, Feb. 1953, **5** (2), 11–16; March 1953, **5** (3), 13–16, 26.—The structure of greases and its application to lubrication problems are briefly noted, and methods of application under various conditions are indicated, leading to the development of centralized lub systems. The basic concepts of visc are outlined, and the S.O.D. pressure viscometer and the Steiner plunger rheometer are described and illustrated. The rheological interpretation of the curves obtained with the plunger rheometer is indicated, and the use of rheological data in production control is described.

The development of the penetration test is briefly described, its disadvantages indicated, and its value in manufacture is discussed. Penetration limits and the variation of consistency with temp are also considered. J. G. H.

1792. Lubrication of ball and roller bearings. Pt 2. Anon. *Sci. Lubric.*, Nov. 1952, **4** (11), 12–16; Feb. 1953, **5** (2), 17–23; March 1953, **5** (3), 17–24.—The relative fields for the application of oil or greases as lubricant are discussed, oil being preferred for high speeds and conditions where very high or low temp are likely to be encountered. The most suitable types of oil and grease for the purpose are indicated, and the characteristic properties of the various base greases are discussed.

Procedure necessary for greasing a new bearing is outlined, and the dangers of overgreasing are emphasized. Methods of replenishing with grease are indicated, and some devices for the prevention of overgreasing are noted. The S.K.F. grease valve is briefly described, and the co-ordination of the housing design with lubrication problems is discussed, together with the grease lubrication of vertical shafts.

Methods of applying lub oil described and illustrated include bath lubrication, wick lubrication for small bearings, circulation within a closed system, the functioning of screw threads as pumps, rotating oil reservoirs, pressure circulation systems, and oil mist lubrication. J. G. H.

1793. Role of the lubricant in bearing fatigue. E. C. Carmichael and R. B. Purdy. *Lubric. Engng*, Dec. 1952, **8** (6), 295–7, 314–16.—While bearing fatigue failures, in general, are not influenced directly by the lubricant, the latter, by preventing excessive rise in bearing temp, by wearing-in or effecting highly polished surfaces, by protecting against corrosion, and by sealing against contaminants, can often play an important part in minimizing metallic fatigue. The effect of lubricant visc, of film strength improving additives, and of rust preventive properties in this connexion are discussed in detail. J. G. H.

1794. Tired bearings—reasons and remedies. J. Palsulich. *Lubric. Engng*, Dec. 1952, **8** (6), 293–4, 313–14.—The composition and construction of sleeve bearings in common use is described, and the effects of design and operating conditions upon fatigue are discussed. The comparative resistance to fatigue of various bearing materials is presented in tabular form. Erosion as a specialized form of bearing fatigue is described, and measures put forward for its elimination; fatigue as an aftermath of lead corrosion in copper–lead bearings is considered. J. G. H.

1795. Frictional properties of polytetrafluorethylene. Anon. *Sci. Lubric.*, Apr. 1953, **5** (4), 17–18.—Investigations carried out by Production Engineering Research Association of Great Britain on problems of friction between sliding surfaces of machine tools are briefly described. The relative frictional characteristics of cast iron and laminated plastic slideways on boring machines, together with the effects of different lubricants, soluble, light, and heavy oils, graphited oils, and molybdenum disulphide, on cast iron slideways and the possibilities of polytetrafluorethylene as a material for sliding surfaces are discussed. J. G. H.

1796. Low viscosity oils—SAE 20W or SAE 10W? F. Laurence. *Sci. Lubric.*, 1952, **4** (12), 26–7.—While it is generally agreed that the use of low visc oils for motor vehicle lubrication results in appreciable reduction in fuel consumption, the question arises as to how far it is profitable to go in this direction. Results of tests at Thornton, covering effect of visc on b.h.p., oil pressure and visc, and wear and visc, indicate that while SAE 10W oils show advantages in all directions, the overall value of SAE 5W oils is open to question. J. G. H.

1797. U.S.A.F. grease development and lubrication problems. B. Rubin and J. C. Mosteller. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, Feb. 1953, **16** (11), 14–23.—Recent developments in military aircraft have resulted in a demand for lubricants standing up to increasingly severe conditions, both low and high temp. The need for an extreme low temp grease has led to the development of a diester type grease as covered by spec MIL-G-7421 (USAF) which can be used at temp of −65° to 100° F; its development and properties are outlined. The development of high temp greases in the 400° to 500° F range has been facilitated by the use of thickening agents such as copper phthalocyanines and other nitrogen compounds which are stable at high temp and commercially available. The greatest current need is for wide range oils (−100° to 500° F) and oils for extremely high temp greases. Lubrication problems successfully solved include silicone diester oil blend lithium soap greases for the lubrication of rubber-to-metal components on pneumatic systems, lubricants for use with powerful oxidizing agents in rocket motors, and the packaging and preservation of bearings. The lubrication of electric gyro instrument elements in highly evacuated and hermetically sealed cases presents a problem which has still to be solved. J. G. H.

1798. Materials specifications for oil-film bearings. E. B. Etchells. *Lubric. Engng.*, Dec. 1952, **8** (6), 291–2, 312–13.—The main requirements of a bearing material, score resistance, deformability, fatigue strength, and corrosion resistance, are discussed in some detail, and the special properties of babbitt metals, copper–lead alloys, bronzes, aluminium, and cadmium alloys, together with those of zinc castings and sintered powdered metal, are enumerated. J. G. H.

1799. Review of B.S.I. specification for engine lubricating oils (H.D. type—B.S. 1905–1952). Anon. *Sci. Lubric.*, Feb. 1953, **5** (2), 28–9.—The relation of B.S. 1905 to US Army Ordnance MIL-O-2104 spec is indicated, and the continued use of CRC, Chevrolet, and Caterpillar engine tests is remarked. The scope from SAE 10 to SAE 50 visc oils is noted, and methods of obtaining approval are described. Final notes express regret at the non-inclusion in the specifications of any re-branding or re-blending procedures and at the omission of any provision for tests covering Supplement 1 and Supplement 2 (Series 2) oils. J. G. H.

1800. Cavitation in journal bearings. H. L. McBroom. *Sci. Lubric.*, Apr. 1953, **5** (4), 10–16.—Details are presented of a small-scale investigation of the primary effects of cavitation in the divergent part of a lubricating oil film, in a lubricated bearing. The apparatus employed comprised a rotating shaft supported in bearings with a small running clearance and means of displacing the bearing relative to the shaft in both horizontal and vertical directions, together with the necessary measuring instruments and temp regulating equipment. Pressure variations measured under a variety of conditions are illustrated graphically, and the effect of pressure feed, air in soln, reduced clearance, and static load are discussed. J. G. H.

1801. Performance of synthetic greases. E. R. Booser, A. E. Baker, and E. G. Jackson. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, Dec. 1952, **16** (9), 8–18.—The use of silicones, diesters, and polyethylene glycols in the formulation of synthetic greases is discussed, and the special advantages accruing from each class are indicated. Their comparative merits in bleeding and evaporation tests, high temp ball-bearing operation, low temp torque and lubricating tests are considered, and the relationship between test results and field operation is discussed, with an objective of lubricants for use in the range of 200° to 400° C, and higher, as an ultimate goal. J. G. H.

1802. Field performance of detergent-type motor oils in gasoline-powered vehicles. A. C. Pilger. *S.A.E. quart. Trans.*, July 1952, **6** (3), 424–37.—The historical background of the use of detergent additives in lub oils for both diesel and gasoline engines is briefly sketched, and details are presented of a continuous programme of field testing of detergent oils in gasoline engines conducted by Tide Water Associated Oil Co in order to discover the causes and remedies for engine deposits. The major factors involved are indicated as motor oil, gasoline, engine design, maintenance, and type of service. From tests covering heavy-duty highway truck service, light-duty city pick-up and delivery service, and high-speed cross-country passenger car operation, it is concluded that detergent oils are at least as valuable in light-duty service and high-speed passenger car operation as in heavy-duty truck operation and that inhibitor detergent additives improve engine cleanliness characteristics of base oils. Oil-type classifications, based primarily on lab engine tests intended to predict diesel operation, cannot be expected to predict accurately performance in gasoline service; base stock characteristics, additive composition, and mutual compatibility constitute variables, rendering necessary the careful selection of base oil and additive combinations to fit field conditions. Engine design modifications can afford a positive means of minimizing wet sludge deposits, and reduction in oil drain period can consistently result in improved engine cleanliness on heavy-duty passenger car and truck operations.
J. G. H.

1803. Lubricating properties of molybdenum disulphide. I. M. Feng. *Lubric. Engng*, Dec. 1952, **8** (6) 285–8, 306–8.—Results of an investigation into the lub properties of molybdenum disulphide are reported. The significance of crystal structure in relation to lub properties is discussed, and molybdenum disulphide is compared with graphite from this angle. The methods of application of molybdenum disulphide are enumerated and its friction coeff under ordinary conditions is discussed, together with the effect of atmospheric temp, sliding speed, normal load, and crystallographic orientation. Experimental results indicate that the friction characteristics depend largely on crystallographic orientation, which was studied with X-ray diffraction equipment under a variety of conditions and compared with equivalent characteristics of graphite. J. G. H.

1804. Foaming of heavy oils. R. G. Moyer. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, Feb. 1953, **16** (11), 8–12.—The incidence of foaming in lub oils is remarked, and details are presented of an investigation into the relationship between foaming tendency and temp. A series of Mixmaster tests indicated that for each oil there is a critical temp at which the increase in volume due to foaming is greater than either higher or lower temp and also a critical visc range; details are given of the application of this data to the solution of heavy oil foaming complaints in gear cases. J. G. H.

1805. Plant value improved by lubrication. G. D. Jordan. *Sci. Lubric.*, Jan. 1953, **5** (1), 13–17.—The significance of lubrication in improving productivity and reducing running costs is indicated, and the subject is considered from the standpoints of the lubricant used, method of application, and necessary related changes in the design of the plant. Points outlined are illustrated in the operation of a hot rolling mill. Individual components are dealt with from the lub angle, and the savings effected both in lubricant consumption and bearing life are tabulated. J. G. H.

1806. Cleaning lubrication systems. A. S. Morrow. *Lubric. Engng*, Feb. 1953, **9** (1), 10–13, 42.—The necessity for maintaining industrial lubrication systems in a clean condition is stressed, and the main materials used for the purpose are discussed and their special features indicated. Procedures and materials for cleaning steam turbines, hydraulic systems, steel mills, paper mills, compressors, I.C. engines, and heat exchange systems are considered in some detail. J. G. H.

1807. Preparation and properties of silica aerogel-thickened greases. E. C. Milberger and L. J. Swatik. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, Jan. 1953, **16** (10), 18–29.—Silica-aerogel greases comprise thickened lubricants with a finely divided silica used as the gelling agent. They are characterized by extreme ease and reproducibility of preparation at ordinary temp with conventional mixing equipment. Lab tests reported

indicate that, properly compounded with appropriate additives, they possess adequate water resistance, consistency stability at high temp, excellent oxidn resistance, and low bleeding tendencies. Their exceptionally flat temp *vs* consistency curve frequently permits the use of softer grades than would be required with soap-type greases. Successful field applications under a wide variety of conditions indicate marked possibilities as a multi-purpose grease. J. G. H.

1808. X-ray diffraction studies of oriented soap structures in grease-like systems. M. J. Vold. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, Nov. 1952, **16** (8), 8–17.—Details are presented of a preliminary investigation into the structure of greases, employing an X-ray method for the determination of orientation of the soap particles. Preliminary studies of the packing characteristics of calcium stearate hydrate, of the orientation effects in commercial greases, and in mechanical pastes of calcium stearate in oily media are discussed in some detail, and lead to the conclusion that the primary variable to be considered in formulating a theoretical approach to the whole subject of grease structure is the mechanical treatment to which the sample is subjected. J. G. H.

1809. Evaluation of lubricants for use in computing machines. L. J. Hibbert and R. F. McKibben. *Lubric. Engng*, Feb. 1953, **9** (1), 16–18.—The special requirements in the lubrication of computing machines are indicated, methods of laboratory evaluation are outlined, functional evaluation and life testing are considered, and the importance of field evaluation is illustrated. J. G. H.

1810. Recommended practices for the cleaning of turbine lubricating systems after service. F. E. Rosenstiehl. *Lubric. Engng*, Feb. 1953, **9** (1), 14–15, 37–40.—A summary of the recommendations of the Joint ASTM–ASME Committee on Turbine Lubrication. Covers oil coolers, stationary and marine, oil systems, steam and hot water cleaning of stationary units, cleaning with flushing oils, cleaning during service, and the cleaning of marine propulsion units. J. G. H.

1811. Lubrication of the Rapier W 1400 walking dragline. Anon. *Sci. Lubric*, Nov. 1952, **4** (11), 24–7.—The constructional and mechanical features of the W 1400 walking dragline, a mobile excavating plant capable of stripping ironstone to a depth of 100 ft, are briefly described, and the special lub equipment for ring rollers, boom head and main bearings, and for gear boxes is discussed. J. G. H.

1812. Metal cutting developments. R. J. S. Pigott. *Lubric. Engng*, Dec. 1952, **8** (6), 289–90, 308–12.—The mechanics of the application of cutting oils are briefly described, and details are presented of the Hi-Jet system, whereby a jet of oil, small enough in width to enter the space between the heel of the tool and the moving work, is applied from below the cutting edge. The advantages derived from this method of application under varying conditions are detailed, and operating methods are indicated. J. G. H.

1813. Patents. U.S.P. 2,620,048 (G.B. 14.11.46; 2.12.52). E. W. J. Barrington and E. E. Robinson, assrs to Rotax Ltd. A device for lubricating a rotary member, comprising the combination with the rotary member, of a stationary support, a loaded lubricating pad movably mounted on the support in contact with the periphery of the member.

U.S.P. 2,620,301 (9.12.50; 2.12.52). G. D. Mcleod, assr to Standard Oil Co. A grease composition comprising essentially a major proportion of a normally liq oleaginous material, from *ca* 0·1 to *ca* 15% of a water sol guanidine salt of a low mol. wt. acid, and from *ca* 1 to *ca* 50% of a preferentially oil-sol hydrocarbon oil sulphonate.

U.S.P. 2,620,302 (18.11.50; 2.12.52). O. L. Harle, assr to California Research Corpn. A lub oil composition comprising a major proportion of a mixture of 1 : 2-polyalkylene glycol polymeric material of lub oil visc and hydrocarbon oil in an amount, by wt, of the polymeric material of *ca* $\frac{1}{4}$ to *ca* 3 times the amount of the polymeric material, and sol in the mixture, *ca* 0·1 to *ca* 1% of zinc dithiocarbamate, and *ca* 1 to *ca* 10% of an alkaline earth metal salt of an alkyl-substituted phenol, having at least 4 to 20 carbon atoms in at least one alkyl group.

U.S.P. 2,622,094 (11.3.49; 16.12.52). T. F. Rutledge and F. M. Seger, assrs to Socony-Vacuum Oil Co. The process for preparing a synthetic lubricant having good colour, low carbon residue, and high V.I.

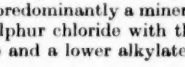
U.S.P. 2,622,112 (13.10.49; 16.12.52). C. M. Van Battum, assr to Shell Development Co. A method of producing aromatic hydrocarbons useful as lub oil from a mixture of aromatic hydrocarbons boiling in the kerosine range and a mixture of predominantly straight-chain olefins.

U.S.P. 2,623,016 (17.1.49; 23.12.52). R. W. Mertes, assr to Union Oil Co of California. A mineral lub oil suitable for use in I.C. engines containing a minor proportion, sufficient to impart detergency characteristics to the oil, of a modified oil-sol metal petroleum sulphonate.

U.S.P. 2,623,017 (3.8.50; 23.12.52). W. B. Whitney, assr to Phillips Petroleum Co. An improved grease comprising a lub oil, a lithium soap, and a potassium soap.

U.S.P. 2,623,018 (17.12.40; 23.12.52). E. B. Cyphers and A. H. Popkin, assrs to Standard Oil Development Co. A lub composition having improved E.P. resisting properties which consists essentially of a major amount of a lubricant, having combined therein a compound formed by heating together a di-alkyl ester of a di-glycol carbonate with an alkali metal salt of an alkyl-substituted dithiophosphoric acid.

U.S.P. 2,623,019 (16.1.47; 23.12.52). D. F. Wilcock and M. M. Sprung, assrs to General Electric Co. A lub oil consisting esssentially of: (1) a liq polymeric hydrocarbon-substituted polysiloxane; (2) a mixture of ingredients comprising (*a*) a chlorinated aliphatic hydrocarbon or a chlorinated *cyclo*aliphatic hydrocarbon having a b.p. above 100° C, and (*b*) a compound corresponding to the general formula



U.S.P. 2,621,158 (2.2.49; 9.12.52). F. C. Teeter, assr to Sinclair Refining Co. A lub oil composition comprising predominantly a mineral oil and containing a compound prepared by the reaction of sulphur chloride with the reaction product of a bicyclic terpene, a phosphorus sulphide and a lower alkylated monohydric phenol or a lower aliphatic monohydric alcohol.

U.S.P. 2,621,159 (5.11.49; 9.12.52). G. L. Perry and S. K. Talley, assrs to Shell Development Co. A metal-working lubricant consisting of a base blend of a soft residue wax and an olefinic hydrocarbon polymer.

U.S.P. 2,620,303 (9.7.49; 2.12.52). W. Lowe and J. O. Clayton, assrs to California Research Corpn. A sulphur-containing lub oil composition severely corrosive to silver, and a small amount, sufficient to reduce the sulphur attack on silver, of a 2-mercaptothiazine.

U.S.P. 2,620,365 (30.3.49; 2.12.52). J. A. Anderson, assr to Standard Oil Co. A method of producing lub oils of high visc, high V.I., and low pour point from α-olefins in the ranges of C_{15}–C_{25}.

U.S.P. 2,620,309 (16.12.50; 2.12.52). W. T. Stewart and A. Goldschmidt, assrs to California Research Corpn. Lub oil composition comprising a major proportion of a blend of hydrocarbon oil and polyalkylene glycol polymeric material of lub oil visc in an amount by vol, of *ca* ¼ to *ca* 4 times the amount of hydrocarbon oil, and a minor amount, sufficient to lower the miscibility temp of the blend, of at least one monohalide.

U.S.P. 2,620,304 (16.12.50; 2.12.52). W. T. Stewart and A. Goldschmidt, assrs to California Research Corpn. Lub oil composition comprising a major proportion of a blend of hydrocarbon oil and polyalkylene glycol polymeric material of lub oil visc in an amount, by vol, of *ca* ¼ to *ca* 4 times the amount of the hydrocarbon oil, and a minor amount, sufficient to lower the miscibility temp of the blend, of a solubilizing agent.

U.S.P. 2,620,305 (16.12.50; 2.12.52). W. T. Stewart and A. Goldschmidt, assrs to California Research Corpn. Lub oil composition comprising a major proportion of a blend of hydrocarbon oil and polyalkylene glycol polymeric material of lub oil

visc in an amount, by vol of *ca* ¼ to *ca* 4 times the amount of the hydrocarbon oil, and a minor amount, sufficient to lower the miscibility temp of the blend, of a monoamine.

U.S.P. 2,620,306 (16.12.50; 2.12.52). W. T. Stewart and A. Goldschmidt, assrs to California Research Corpn. Lub oil composition comprising a major proportion of a blend of hydrocarbon oil and polyalkylene glycol polymeric material of lub oil visc in an amount, by vol, of *ca* ¼ to *ca* 4 times the amount of the hydrocarbon oil, and a minor amount, sufficient to lower the miscibility temp of the blend of at least one carboxylic acid, ester, ketone, or aldehyde of a specified formula.

U.S.P. 2,620,307 (16.12.50; 2.12.52). W. T. Stewart and A. Goldschmidt, assrs to California Research Corpn. Lub oil composition comprising a major proportion of a blend of hydrocarbon oil and polyalkylene glycol polymeric material of lub oil visc in an amount, by vol, of *ca* ¼ to *ca* 4 times the amount of hydrocarbon oil, and a minor amount, sufficient to lower the miscibility temp of the blend, of an ether.

U.S.P. 2,620,308 (16.12.50; 2.12.52). W. T. Stewart and A. Goldschmidt, assrs to California Research Corpn. Lub oil composition comprising a major proportion of a blend of hydrocarbon oil and polyalkylene glycol polymeric material of lub oil visc in an amount, by vol, of *ca* ¼ to *ca* 4 times the amount of the hydrocarbon oil, and a minor amount, sufficient substantially to lower the miscibility temp of the blend, of an alkylated monohydric phenol.

U.S.P. 2,622,067 (15.9.49; 16.12.52). R. V. White and P. S. Landis, assrs to Socony-Vacuum Oil Co. An emulsifiable oil which comprises an oil containing between *ca* 0·01 and *ca* 10%, by wt, of the reaction product obtained by reacting an aliphatic monocarboxylic acid with a polyalkylenepolyamine.

U.S.P. 2,623,852 (19.12.49; 30.12.52). W. H. Peterson, assr to Shell Development Co. An oleaginous composition having high resistance to disintegration by water, comprising an oleaginous liq thickened to a gel grease-like consistency by addition thereto of an initially hydrophilic solid inorganic gel and an inorganic gel of an at least partially oleophilic poly-amino-oxy-compound.

U.S.P. 2,623,853 (6.4.51; 30.12.52). F. H. Stross, assr to Shell Development Co. A grease composition comprising an organic lub liq having colloidally dispersed therein a grease-forming amount of a clay. D. A. R.

Bitumen, Asphalt, and Tar

1814. Bituminous materials, their processing and use in the mirror of recent German patent literature. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (2), 34–9; **4** (3), 63–5; **4** (4), 109–10; **4** (5), 134–5.—Detailed information and classification of the patent specifications. R. T.

1815. Raw materials for composition roofing. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (2), 46–9.—Pt II discusses in detail bitumen production, tar processing, fillers, dusting materials, adhesives, and renovation of roofings. R. T.

1816. Information on adhesives (adhesion improvers for road tars). H-G. Franck. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (2), 32–4.—Factors controlling adhesion of binders to stone and the theory of adhesion improvers are discussed. The affinity of tar to stone surfaces cannot be so improved that it displaces water therefrom. Pretreatment of the stone is better. Results depend upon the type of stone; with tarmacadam they are good, but blast furnace slag requires a sp adhesive. R. T.

1817. Rubber-bitumen in road construction. E. Steinhilber. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (2), 27–31. (*Cf.* Abs. 2206, 2730, **1951**; 578, 783, **1952**; 184, 860, **1953**.)—Additions of natural and synthetic rubber have been found to improve bitumen road surfacings. Tabulated results of standard mechanical tests show comparative effects of German rubber meal—from lightly vulcanized scrap rubber—and Pulvatex additions, on soft. pt, pen, adhesive power, adhesiveness, cold flow, etc. German rubber meal from scrap rubber improves the properties of road surfacings. R. T.

1818. Patents. U.S.P. 2,620,312 (25.9.49; 2.12.52). D. N. Manzer, assr to American Bitumuls and Asphalt Co. In the process of incorporating in an oil-in-water type emulsion having water as its continuous phase and a bitumen as its discontinuous phase, an additive which upon incorporation therein tends to break the emulsion.

U.S.P. 2,621,150 (Paraguay 8.11.49; 9.12.52). F. M. Mora. In the method of cracking tar, the steps comprising spraying a film of tar against a surface heated to a cracking temp, retaining the tar film on the heated surface, progressively moving the locus of spray to continuously spray new increments of tar on successive surface areas heated to the cracking temp, progressively removing from the heated surface solid residues produced during cracking, and recovering the cracked vapours.

U.S.P. 2,622,313 (4.12.48; 23.12.52). C. R. MacDonald, assr to Patent and Licensing Corpn. An applicator roll for applying bituminous emulsion to a fibrous web.

U.S.P. 2,622,963 (11.7.50; 23.12.52). B. P. Wallace, assr to Whitehead Brothers Co. A loose-powdered product for use as an additive for loose moulding sand.

U.S.P. 2,623,831 (23.11.48; 30.12.52). L. A. Mikeska, assr to Standard Oil Development Co. An improved bituminous bonding composition comprising a mixture of asphalt and at least one anti-stripping addition agent. D. A. R.

Special Hydrocarbon Products

1819. Patents. U.S.P. 2,620,345 (13.7.51; 2.12.52). W. K. Dean, assr to Mallinckrodt Chemical Works. An aluminium soap of a plurality of soap-forming acids consisting essentially of a major proportion by wt of oleic acid and minor proportions by wt of naphthenic and dimerized linoleic acids, the minor proportions being not less than approx 5%.

U.S.P. 2,620,358 (11.1.49; 2.12.52). K. D. Detling and P. Guinn, assrs to Shell Development Co. A process for the production of an unsaturated aldehyde or ketone.

U.S.P. 2,621,163 (13.3.47; 9.12.52). C. V. Coash, assr to Sherwin-Williams Co. A pest-lethal coating composition consisting essentially of a pest toxic agent, a solid amorphous binder, and a volatile hydrocarbon mutual solvent.

U.S.P. 2,621,205 (15.8.49; 9.12.52). T. F. Doumani, C. S. Coe, and E. C. Attane, assrs to Union Oil Co of California. A method of making nitrogen oxide addition products of *cyclo*-olefines.

U.S.P. 2,621,207 (27.1.52; 9.12.52). V. C. Fusco and E. Noyes, assrs to Mathieson Chemical Corpn. The production of *iso*propyl 2 : 4 : 5-trichlorophenoxyacetate from the sodium salt of the corresponding halophenoxyacetic acid.

U.S.P. 2,621,213 (19.7.49; 9.12.52). G. G. Joris, assr to Allied Chemical and Dye Corpn. A process for accelerating oxidn of commercial grade, dist aralkyl hydrocarbon in liq phase by elemental oxygen to hydroperoxide as major product.

U.S.P. 2,621,215 (18.5.50; 9.12.52). R. S. Cooper, assr to Diamond Alkali Co. A composition of matter consisting essentially of tetrachlorethylene and a stabilizing amount of 2-chlorothiophene or 2-bromothiophene.

U.S.P. 2,621,216 (17.8.50; 9.12.52). R. W. White, assr to Shell Development Co. A process for the production of ethylene.

U.S.P. 2,622,073 (Belgium 21.3.47; 16.12.52). P. Ferrero, F. Berbe, and L. R. Flamme, assrs to Société Carbochimique, S.A. In the production of alkanolamines by the reaction of a low mol alkylene oxide and aq ammonia in any specific molar ratio and under any specific reaction conditions, the improvement which comprises reacting the low mol alkylene oxide and the aq ammonia in the presence of an addition of a quantity of the di-alkanolamine produced by the reaction.

U.S.P. 2,622,075 (Switzerland 3.12.46; 11.12.52). H. M. Hemmi and P. Trefzer, assrs to Sandoz Ltd. A process for the manufacture of a water-sol polymeric organic

nitrogen compound, which comprises heating, as sole reactants, one mol of an amine of the formula :

$$H_2N(C_2'H_4NH)mC_2H_4NH_2$$

wherein *m* is a positive integer, with two equivalents of a compound selected from the group consisting of monomeric and dimeric cyanamide.

U.S.P. 2,622,076 (Netherlands 22.7.49 ; 16.12.52). T. Koch, assr to N.V. Onderzoekingsinstituut Research. Cat process for preparing high mol. wt. linear macromolecular amino acid-polycondensates from lactams.

U.S.P. 2,622,077 (6.12.50 ; 16.12.52). H. F. Park and H. A. Walter, assrs to Monsanto Chemical Co. A process which comprises polymerizing styrene in contact with a cat amount of pinacolone peroxide at temp above 100° C.

U.S.P. 2,622,092 (8.1.48 ; 16.12.52). A. P. Kozacik and A. N. Sachanen, assrs to Socony-Vacuum Oil Co. Oil-sol polyvalent metal salts of organic acids derived from the oxidn of aliphatic and naphthenic hydrocarbons and boiling above *ca* 300° F.

U.S.P. 2,622,110 (28.2.50 ; 16.12.52). V. N. Ipatieff and H. Pines, assrs to Universal Oil Products Co. A di-(alkyl*cyclo*hexyl) alkane hydrocarbon represented by a given formula and having substituents selected from the group consisting of an alkyl radical, a *cyclo*alkyl radical, a *cyclo*alkalyl radical, and a bi*cyclo*alkyl radical.

U.S.P. 2,623,061 (11.2.49 ; 23.12.52). J. W. Teter and L. E. Olson, assrs to Sinclair Refining Co. In a process for producing nitrogen-containing products from ammonia and olefins, the improvement comprises reacting a mixture containing ammonia and an olefin, the ammonia being present in substantial excess, in contact with a cat consisting of the reduction product of mixed cobalt and magnesium oxides supported on a diatomaceous earth carrier.

U.S.P. 2,623,068 (G.B. 19.1.50 ; 23.12.52). L. E. Cooper and R. N. Lacey, assrs to British Industrial Solvents Ltd. A process for the production of 2 : 2 : 4-trimethyl-3-ol-1-pentanoic acid which comprises oxidizing 5 : 5-dimethyl-2 : 4-di-*iso*propyl-6-hydroxy-1 : 3 dioxan in the liq phase under slightly acidic conditions by intimate contact with a gas containing mol oxygen in the presence of an oxidn cat.

U.S.P. 2,623,888 (4.1.51 ; 30.12.52). J. Nichols, assr to Interchemical Corpn. As new compounds, a member of the group consisting of 12-keto-9 : 10-octadecenoic acids and esters thereof.

U.S.P. 2,623,889 (4.1.51 ; 30.12.52). J. Nichols, assr to Interchemical Corpn. A member of the group consisting of diketo-9 : 10-octadecenoic acid and esters thereof, the diketo acid having an empirical formula of $C_{18}H_{30}O_4$, and a m.p. of 112°–113° C.

D. A. R.

Derived Chemical Products

1820. Understanding the chemistry of petrochemical reactions. Pt II. Non-hydrocarbon constituents of petroleum. Sulphur and nitrogen compounds. L. F. Hatch. *Petrol. Refin.*, 1953, **32** (6), 105–7.—Discusses the amounts and types of sulphur and nitrogen compounds found in American crudes, and mentions the methods of separation and identification of the different classes. R. D. S.

1821. Celanese dedicates Pampa plant. Anon. *Petrol. Refin.*, 1953, **32** (6), 133–4.—Celanese's new petrochemical plant at Pampa, Texas, which came into operation last November, utilizes a new process for the air oxidn of natural gases to produce a mixture of organic chemicals, mainly acetic acid and anhydride. A feature is the plant-wide adoption of perforated plate, or sieve, columns. R. D. S.

1822. Tuscola plant located closer to petrochemical markets. D. J. Stark. *Petrol. Refin.*, 1953, **32** (6), 139–42.—A description of the petrochemical plant at Tuscola, Illinois, at a junction point of two major gas transmission lines. It is designed to process 425 million cu.ft/day of gas producing 10 million cu.ft/day of ethane for cracking to produce ethylene and ultimately 40 million gal/year ethyl alcohol and 50 million lb/year ethyl chloride. Approx ½ million gal/day of other hydrocarbons are also recovered.

Details and flowsheets of the hydrocarbon extraction unit, consisting of a light and heavy oil absorption system, and of the hydrocarbon fractionation unit are given.
R. D. S.

1823. The use of oxygen in the petrochemical industry. Pt I. Basic considerations and commercial combustion processes. P. W. Sherwood. *Petrol. Refin.*, 1953, **32** (6), 90–4.—An outline of the use and production of tonnage oxygen and a discussion of the chemical and thermal advantages accruing from the absence of nitrogen in the reaction gases. The partial combustion of methane to give synthesis gas by both the thermal and the semi-cat processes is considered from the thermodynamic and commercial production angles, reaction conditions being given for theory and practice.
R. D. S.

1824. Ethylene as base material for the chemical industry and the manufacture of high molecular compounds. J. C. Vlugter, E. J. C. Toxopeus, and R. P. van Oosten. *Ingenieur, 's Grav.*, 12.6.53, **65** (24), 35–9.—After emphasizing the importance of ethylene as a petrochemicals base material, the authors discuss the principal industrial reactions involving ethylene. An analysis is made of the ethylene potentials in the U.S.A., Europe, and the Netherlands, and production figures for 1950 compared with estimated figures for 1962. 4 main ethylene separation processes are described in some detail and illustrated with flow diagrams. The authors conclude that, although the quantity of ethylene potentially available in Western Europe is sufficient, tariff barriers and the high cost of ethylene impede the establishment of an important ethylene-based industry. 15 tables and figs and 28 refs are included. G. F. T. C.

1825. Patents. U.S.P. 2,620,290 (23.10.47; 2.12.52). N. E. Searle, assr to E. I. du Pont de Nemours and Co. An insecticidal composition containing as an essential active ingredient in solution in water or a ketone, an α, Ω-thiocyanoalkanol having the formula $HO(CH_2)_nSCN$, wherein n is 4 to 5 inclusive.

U.S.P. 2,620,291 (26.2.47; 2.12.52). H. L. Johnson and A. P. Stuart, assrs to Sun Oil Co. The method of controlling damage by larvæ which comprises applying 1 : 2 : 3 : 4-tetrachlorobutane to loci infested with black carpet beetle larvæ.

U.S.P. 2,620,292 (19.7.50; 2.12.52). W. S. Emerson and R. A. Heimsch, assrs to Monsanto Chemical Co. An insecticidal composition comprising an inert carrier and, as the essential active ingredient in a quantity which is toxic to insects, an alkyl ar-(*iso*thiocyanomethyl) benzoate in which the alkyl radical has from 1 to 8 carbon atoms.

U.S.P. 2,622,098 (G.B. 15.3.46; 16.12.52). A. E. Stanley and K. H. W. Turck, assrs to Distillers Co. A continuous process for the production of acetic anhydride by the liq phase oxidn of acetaldehyde by means of mol oxygen at 45° to 55° C with the aid of a copper and cobalt cat.

U.S.P. 2,622,100 (G.B. 29.3.46; 16.12.52). G. Newbery and D. D. Libman, assrs to May and Baker Ltd. An X-ray contrast medium in the form of a stable, viscous liq consisting of the secondary octyl ether of 2 : 4 : 6-tri-iodophenol.

U.S.P. 2,622,105 (10.5.49; 16.10.52). L. A. Miller, J. H. Dunn, C. M. Neher, and S. N. Hall, assrs to Ethyl Corpn. A continuous process for the manufacture of benzene hexachloride.

U.S.P. 2,622,106 (22.12.48; 16.12.52). W. A. Stover, assr to Socony-Vacuum Oil Co. A process for the production of 1 : 1 : 2-trichloro-1-fluoroethane.

U.S.P. 2,622,107 (28.10.50; 16.12.52). G. W. Mattson, assr to Ethyl Corpn. In the process of producing an alkyl chloride by the reaction of an alcohol and hydrogen chloride at elevated temp in the presence of a concentrated soln of metal chloride cat, the improvement comprises introducing a foam-suppressing quantity of sulphur dioxide into the reaction space in proportions of from 0·001 to 0·01 mol/mol of hydrogen chloride.

U.S.P. 2,622,974 (31.5.50; 23.12.52). A. W. Swezey, assr to Dow Chemical Co. A herbicide composition comprising as active toxicants a mixture of from 1 to 5 parts wt of monochloroacetic acid and 2 parts by wt of trichloroacetic acid, the toxic materials being present in the composition as free acids or their water-sol salts.

U.S.P. 2,622,975 (30.6.50; 23.12.52). P. W. Zimmerman and A. E. Hitchcock, assrs to Boyce Thompson Institute For Plant Research Inc. The plant regulant composition for killing plants, comprising chloroacetic acid in an amount varying from 0·3 to 10% and undecylenic acid in an amount varying from 0·3 to 10%.

U.S.P. 2,622,976 (30.6.50; 23.12.52). A. E. Hitchcock and P. W. Zimmerman, assrs to Boyce Thompson Institute For Plant Research Inc. The method of controlling the growth of weeds, comprising the pre-emergence treatment of soil with an aq soln of chloroacetic acid in an amount varying from 20 to 40 lb of chloroacetic acid per acre, the soil having been previously planted to seeds for the growing of a crop.

U.S.P. 2,623,013 (24.9.49; 23.12.52). G. F. D'Alelio, assr to Koppers Co. Ion-exchange resins from a vinyl pyridine or a vinyl quinoline and a vinyl ethinyl hydrocarbon.

U.S.P. 2,623,036 (17.1.50; 23.12.52). H. T. Neher, W. L. Van Horne, and La V. N. Bauer, assrs to Rohm & Haas Co. A copolymer of: (*a*) an ester of acrylic acid and a saturated monohydric aliphatic alcohol and (*b*) an ester of a saturated monohydric aliphatic alcohol.

U.S.P. 2,623,037 (25.8.49; 23.12.52). R. V. Jones, assr to Phillips Petroleum Co. A process for producing alkali metal polyvinyl sulphate.

U.S.P. 2,623,049 (18.3.47; 23.12.52). H. D. Norris, assr to Socony-Vacuum Oil Co. Preparation of halothenyl halides, including 5-chlor-2-thenyl chloride.

U.S.P. 2,623,056 31.5.49; 23.12.52). W. E. Elwell, assr to California Research Corpn. A neutral monomeric ester of a cyclic polycarboxylic acid, having the formula $A(COOY)_n$ wherein A is the hydrocarbon-ring residue of the polycarboxylic acid, and Y is the radical of a monomeric polyester of a polyhydric alcohol having at least 3 hydroxyl groups, all of these groups but one having been esterified by monocarboxylic unsaturated fatty acids, the unesterified hydroxyl group being the only functional group in the monomeric polyester capable of reacting with a carboxyl group, and wherein n is an integer of at least 4.

U.S.P. 2,623,887 (22.5.48; 30.12.52). A. H. Matuszak, assr to Standard Oil Development Co. A mixed partial ester of sorbitan or pentaerythritol, the esterifying group being oleic acid and ethane sulphonate.

U.S.P. 2,623,894 (Netherlands 26.6.50; 30.12.52). E. A. M. F. Dahmen, assr to Shell Development Co. In the process of producing an ester of sulphuric acid, pyrosulphuric acid, phosphoric acid, or pyrophosphoric acid by reacting the acid with an olefin having at least 6 carbon atoms per mol, the improvement comprises esterifying the olefin with the acid in the presence of an organic carbonyl compound.

U.S.P. 2,623,905 (23.8.50; 30.12.52). H. Pines and V. N. Ipatieff, assrs to Universal Oil Products Co. A process for producing *iso*valeraldehyde which comprises reacting one mol proportion of *iso*prene and from *ca* 1·5 to *ca* 20 mol proportions of H_2O in the presence of a solid acid-acting cat at a temp of from *ca* 150° to *ca* 500° C.

D. A. R.

Coal, Shale, and Peat

1826. Development of oil shale distillation in Germany. H. A. Beyer and R. Mewes. *Erdöl u. Kohle*, 1953, **6**, 204–7.—German shale deposits are mainly in southwest, average oil content is 4·5%. Some attempts at underground gasification of shale have been made; pile-coking of shale was also attempted at end of war, but was a failure. Other, more conventional, shale processing plants could not compete with crude oil. One works, using Otto retort (sketch given) is now operating at capacity of 480 tons shale/day; yield is 90% of available oil, and residue is suitable cement base. V. B.

1827. Coal gas, raw material for chemical industry. P. Ferrero. *Chim. et Industr.*, 1953, **69**, 1033–42.—Methods available for utilizing ethylene and methane (including that from coal mines) are outlined, with particular reference to conditions in Belgium. Yield of ethylene (2·5% max) can be increased by cracking of ethane, and kinetics of this reaction are briefly discussed. V. B.

1828. Patents. U.S.P. 2,623,011 (30.11.46; 23.12.52). A. J. Wells, assr to E. I. du Pont de Nemours and Co. Preparation of olefins by particulate coal carbonization.

U.S.P. 2,623,843 (31.8.49; 30.12.52). G. E. Phillips, assr to Standard Oil Development Co. The method which comprises mixing shale oil with spent unburnt Colorado oil shale fines in a ratio of 2 to 20 lb of the spent shale fines per gal of the oil, and coking the resulting mixture. D. A. R.

Miscellaneous Products

1829. Conductivity of insulating oils at constant potential difference as a function of temperature, applied electric field, and time. R. Guizonnier. *Rev. Gen. Elect.*, 1953, **62**, 247–54.—Details are given of a measuring circuit having sensitivity of about 5×10^{-13} amp and measuring resistances of order of 10^{13} ohm with accuracy of 10%. Tests were made with transformer oil (industrially dried), technical white oil, and liq paraffin. The latter oils were in normal commercial condition, *i.e.*, containing traces of moisture. Resistance of transformer oil decreased with increasing temp (max 60° C in all tests), being approx inversely proportional to visc. Damp white oils showed increasing resistance with increasing temp, due to gradual elimination of H_2O. Subsequent test, *i.e.*, when moisture has been eliminated, gives curves similar to dry transformer oil. Dry liq paraffin showed infinite resistance, within limitations of test procedure. Damp oil shows resistance decreasing hyperbolically with increasing stress (max 2 kV/cm); for dry oil, increasing stress only decreases resistance slightly. Current flowing decreases to const val with duration of application of p.d. After stress application, oil returns to its original state at rate comparable with diffusion process. Reversal of voltage sign causes sharp increase in current, due to repulsion into liq of charges accumulated round electrodes. V. B.

1830. Patents. U.S.P. 2,620,323 (31.3.49; 2.12.52). A. F. Sayko, assr to Standard Oil Development Co. A composition of matter comprising a cured, low unsaturation copolymer of a major proportion of an *iso*-olefin and a minor proportion of diolefin containing 5 parts of poly*iso*butylene having a mol. wt. number of 100,000 per hundred parts of copolymers, the copolymer having a Staudinger mol. wt. number between 45,000 and 60,000, and being cured with paraquinone dioxime, sulphur, and an oxidizing agent.

U.S.P. 2,620,324 (1.12.50; 2.12.52). H. W. Coover, Jr., and J. B. Dickey, assrs to Eastman Kodak Co. A process for preparing resinous compositions comprising heating in the presence of a polymerization cat a dispersion of from 60 to 90% by wt of acrylonitrile and from 10 to 40% by wt of an isolated polymer of an amine of an alkenyl carboxylic acid containing from 3 to 5 carbon atoms in the acid radical.

U.S.P. 2,620,326 (29.5.51; 2.12.52). J. Fantl, assrs to Monsanto Chemical Co. A water insoluble infusible derivative of sulphonated polystryene prepared by mixing formaldehyde with an ammonium salt of polystyrene polysulphonic acid in aq soln and removing the water at a temp of at least 20° C.

U.S.P. 2,620,328 (17.11.47; 2.12.52). H. R. Snyder and J. M. Stewart, assrs to Phillips Petroleum Co. The production of synthetic rubber by polymerization in an aq emulsion of a mixture of a major amount of 1 : 3-butadiene and a minor amount of styrene in the presence of a cat and of a promoter-modifier which is a β (N : N-disubstituted amino) alkyl or *cyclo*alkyl mercaptan having at least 2 and not more than 6 carbon atoms in the mercaptan nucleus and in which the (N : N-disubstituted amino) group is selected from the group consisting of N : N-dialkyl groups having a total of not more than 24 carbon atoms, piperidino, and pipecolino groups.

U.S.P. 2,620,329 (9.4.49; 2.12.52). R. R. Dreisbach, assr to Dow Chemical Co. A solid thermoplastic copolymer of from 97 to 99·5% by wt, 3 : 4-dimethylstyrene and from 3 to 0·5% of *p*-chlorostyrene.

U.S.P. 2,620,330 (19.11.49; 2.12.52). H. F. Park, assr to Monsanto Chemical Co. A mass polymerization process which comprises polymerizing styrene at from 100° to 400° C in from 5 to 30 minutes in contact with cyclic succinoyl peroxide.

U.S.P. 2,622,068 (4.6.48; 16.12.52). E. S. Hizer, assr to Procter and Gamble Co. Process of making heat dried detergent compositions containing form II sodium triphosphate.

U.S.P. 2,622,069 (21.8.50; 16.12.52). L. T. Monson, assr to Petrolite Corpn. A process for inhibiting foam, characterized by subjecting a non-detersive foaming composition to the action of not more than 1% of a reagent including a hydrophile oxyalkylated 2 : 4 : 6-C_1- to C_{24}-hydrocarbon-substituted monocyclic phenol—C_1 to C_3—aldehyde resin.

U.S.P. 2,622,070 (19.9.47; 16.12.52). L. T. Monson, assr to Petrolite Corpn. A process for inhibiting foam, characterized by subjecting a foaming composition to the action of not more than 1% of a reagent comprising a mixture of a basic acylated polyaminoalcohol of specified constitution.

U.S.P. 2,623,862 (18.3.49; 30.12.52). J. H. Boyd, assr to Phillips Petroleum Co. In a process for reclaiming rubber, the step of digesting previously vulcanized scrap from natural rubber or a rubbery copolymer of butadiene and styrene. D. A. R.

Corrosion

1831. Economic factors of atmospheric corrosion versus protection. C. C. Harvey. *Petrol. Refin.*, 1953, **32** (6), 122–4.—An analysis of the cost of equipment painting in comparison with the cost of external corrosion allowances, showing that painting is justified only when both the decorative and protective functions are considered. R. D. S.

1832. Reduce corrosion costs with organic inhibitors. C. C. Hulbert and J. A. Rippetoe. *Petrol. Refin.*, 1953, **32** (6), 113–18.—An account of the practical application of an organic corrosion inhibitor and the results of its use in 2 crude-topping towers over a period of 2 years. Best results were obtained with continuous chemical injection into the overhead vapour line from the towers, and the adjustment of the ammonia injection rate to maintain the gasoline accumulator-water pH between 7·5 and 8·0. Results obtained from test coupons indicate an increase of 20 to 60% in the life expectancy of the equipment, and this is partly confirmed by the repairs and maintenance needed.

Corrosion data, obtained from test coupons of 15 different metals placed on the top tray and from 4 in the vapour space, are reported, and also those from couples used to measure galvanic corrosion, both with and without the inhibitor. R. D. S.

1833. Brine corrosion of steel vessels. C. O. Smith. *World Oil*, May 1953, **136** (6), 206.—For most installations, consideration of all factors will show that cathodic protection of steel vessels and pipelines would be advantageous. The effects of certain local brines are reported, and recommendations made on an approx scale for the use of magnesium anodes. In each case the corrosive nature of the brine depended upon the composition, where containing dissolved oxygen, hydrogen sulphide, or acids. 2 refs. A. J. H.

1834. Corrosion control. Anon. *Oil Gas J.*, 29.6.53, **52** (8), 113.—Anærobic bacterial corrosion of pipelines and method of controlling it are briefly discussed. G. A. C.

1835. Fighting corrosion at a Gulf Coast terminus. F. L. Resen. *Oil Gas J.*, 22.6.53, **52** (7), 273.—A metallizing process is described, consisting of spraying a coat of melted zinc upon equipment to be protected, belonging to United Gas Pipe Line Co on Mustang Island. This installation, like others on the coast, is subjected to salt water spray and to high atm temp. G. A. C.

1836. Patents. U.S.P. 2,622,937 (31.5.49; 23.12.52). T. C. Taylor, assr to Standard Oil Co. Apparatus for protecting pipelines and associated equipment from erosion caused by fluidized-solids that are transported in a gas stream in the said pipelines.

U.S.P. 2,623,818 (1.10.51; 30.12.52). W. J. Hanson and R. W. Nex, assrs to Dow Chemical Co. A composition of matter comprising an aromatic solvent oil, and dissolved in the solvent oil: (1) a 2:4-dinitro-6-alkyl-phenol wherein the alkyl radical contains from 3 to 5 carbon atoms, inclusive; (2) furfural as a corrosion inhibitor.

U.S.P. 2,623,835 (Holland 14.3.41; 30.12.52). J. A. van Melsen, assr to Shell Development Co. An improvement in a method of inhibiting corrosion and rusting of metal surfaces by applying to said metal surfaces a corrosion-protective composition comprising a relatively volatile non-polar liq carrier and an effective corrosion-inhibiting agent. D. A. R.

Engines and Automotive Equipment

1837. Design and development of the twin Centaurus power plant for the Bristol "Brabazon." J. L. Norton. *Proc. Instn mech. Engrs, Lond.*, 1951, **164** (3), 281–93.—The adaptation of 8 "Centaur" engines, grouped in pairs, to drive airscrews presenting only 4 discs to the airstream in the Bristol "Brabazon," is described, including their submersion within the wing thickness, and special cooling arrangements. Reasons for the power plant layout selected are given. Detailed descriptions are presented of the dual reduction gear, including primary and auxiliary drives, free wheels and propeller shafts, together with the operating system of the propellers. Testing plant and programmes, fire precautions and detection, and an actual engine fire test are described. Discussion is largely concentrated on gearing features. J. G. H.

1838. Flight experience with Vickers Viscount turbo-propeller airliner. G. R. Edwards. *S.A.E. quart. Trans.*, Apr. 1952, **6** (2), 274–85, 384.—Details are presented of the Rolls-Royce Dart engine installation in the Viscount 700, which is the production prototype of the Viscount 630, the first civil propeller-turbine aircraft to fly. The engine propeller and propeller control unit are described in some detail, and installation development is briefly discussed. Operating experience with the prototype is discussed fully, and indicates advantages from the standpoints of reliability, ease of maintenance, and low operating costs. The propeller-turbine is a power plant in its own right, and not merely an interim step towards the pure jet. J. G. H.

1839. Characteristics of expansion turbines for auxiliary power. R. J. Wood. *S.A.E. quart. Trans.*, July 1952, **6** (3), 438–49.—A previous paper described the use of the expansion of air bled from the compressors of main propulsion gas turbines as a source of auxiliary power in aircraft gas turbines. The extended application of this principle is remarked and illustrated by installations in actual service. Design requirements to this end are outlined, and their essential relationships with gas supply conditions and control characteristics are indicated. It is concluded that the type of installation described is directly competitive with all other forms of auxiliary drives, and will prove most desirable in the larger airplane sizes. J. G. H.

1840. Stages in the design of the large Burmeister and Wain marine diesel engine. H. H. Blache. *Proc. Instn mech. Engrs, Lond.*, 1951, **164** (2), 232–41.—The development of the Burmeister and Wain marine diesel engines from the 2-stroke of 1914–18, through the 4-stroke crosshead to the 6-cyl trunk piston engine are described in detail. Special topics discussed include eccentric drives, crankcase safety doors, and engine cooling. J. G. H.

1841. New Ford six-cylinder engine. E. S. MacPherson. *S.A.E. quart. Trans.*, July 1952, **6** (3), 409–23.—Reasons are presented for the adoption of overhead valves in the 1952 Ford 6-cyl engine, which is described in full detail with indications of the innovations and original features incorporated. J. G. H.

1842. Automotive transport in Saudi Arabia. R. C. Kerr. *S.A.E. quart. Trans.*, Jan. 1952, **6** (1), 73–85.—The building and operation of an automotive transportation system in Eastern Saudi Arabia is described, with special emphasis on the development

of vehicles with reasonable sand mobility and the contrivance of effective heat dissipation from engines where radiator inlets scooped up air from the hot road at 135° F. This latter was effected by the use of oversize radiators with double frontal area, special fans and fan shrouds, the fitting of radiator water-surge tanks, and the substitution of tight-fitting waterproof caps for the conventional pressure cap. J. G. H.

1843. Effect of weight : power ratio on highway transportation. N. R. Brownyer. *S.A.E. quart. Trans.*, July 1952, **6** (3), 450–71.—While the designs of passenger cars have attained new standards of comfort and operation, with higher output engines without material increase in wt, resulting in the elimination of uneconomical operation, the trend in truck and bus design has been towards increasing complexity of controls with inadequate engines, multi-speed transmissions, and 2-speed axles for gear splitting. The increased traffic load on streets calls for an early change in design policy, and remedial measures suggested include the matching of axles, transmission systems, and power plants, with the provision of more efficient engines and transmission systems as the ultimate goal. J. G. H.

1844. Progress of gas turbine truck tests. H. C. Hill. *S.A.E. quart. Trans.*, July 1952, **6** (3), 395–408.—Results covering a year of test runs with the experimental gas turbine-powered motor truck being developed by Boeing are presented. Operating characteristics are discussed, and difficulties encountered during road testing are tabulated, together with procedure for their solution. Engine cooling, oil and fuel consumption are compared with these for conventional engines. The reliability and life of the gas turbine are considered in detail, and the dangers arising from blade and disc vibration are indicated, together with problems of burner-liner life and nozzle-area balance. J. G. H.

1845. Volumetric efficiency of four-stroke engines. J. C. Livengood, A. R. Ragowski, and C. F. Taylor. *S.A.E. quart. Trans.*, Oct. 1952, **6** (4), 617–36.—Breathing capacity or air consumption is considered one of the major factors in I.C. engine efficiency, and volumetric efficiency is the key to this problem. A summary report is presented of an investigation of the subject relating to 4-stroke engines over a considerable period. The effect of volumetric efficiency on operating variables, piston speed, inlet-valve flow capacity, cylinder design, and size are discussed in detail. A single-cyl engine was used and a " gulp " factor, or inlet valve Mach index, is introduced, and its significance as an aid to engine design is explained. J. G. H.

1846. Sleeve bearings—design, manufacture, and installation. R. J. Schager. *S.A.E. quart. Trans.*, Jan. 1952, **6** (1), 165–74.—The materials, design features, installation, and manufacture of sleeve bearings are discussed in detail, and the contribution of each of these factors, together with correct operation and satisfactory maintenance, to the length of effective bearing life is considered. J. G. H.

1847. Torque converter cooling. D. T. Sicklesteel. *S.A.E. quart. Trans.*, Jan. 1952, **6** (1), 150–3.—The design of effective torque converters is discussed from the angles of cooling systems, where vehicle driving conditions are of significance. J. G. H.

1848. Some fuel and power projects. H. Roxbee-Cox. *Proc. Instn mech. Engrs, Lond.*, 1951, **164** (4), 407–24.—The allocation of research projects within the scope of the Ministry of Fuel and Power is briefly described, and the activities of associated committees are indicated. Detailed descriptions are presented of investigations on coal-burning gas turbines, the utilization of available gases from coal, including methane and firedamp, coal gasification, the use of peat as gas turbine fuel, and the possibilities of wind power. J. G. H.

1849. Talented transmissions. J. T. Bugbee. *S.A.E. quart. Trans.*, Jan. 1952, **6** (1), 107–27.—An introductory paper to a symposium on automatic transmissions and torque converters. The terms used in discussing automatic transmissions are defined, the basic mechanisms used are described, and the methods of their combination for the development of modern transmission systems are indicated. Items so discussed include fluid couplings, torque converters, polyphase converter-couplings, and planetary gearings. J. G. H.

1850. Flame photographs of auto-ignition induced by combustion-chamber deposits. L. L. Withrow and F. W. Bowditch. *S.A.E. quart. Trans.*, Oct. 1952, **6** (4), 724–53.—Details are presented of an investigation of deposit types and their effects on auto-ignition, using a photographic technique to illustrate relationships between the occurrence of knock and the development of auto-ignition in the presence of combustion chamber deposits. Previous work on auto-ignition at General Motors Research Laboratories is summarized, and the development of flame photography there is described. Engine explosions occurring during after-running are recorded in a combustion chamber relatively free from deposits, and explosions typical of auto-ignition, pre-ignition, and knock were photographed in the presence of combustion-chamber deposits. From the evidence so obtained it appears that combustion-chamber deposits in the process of purging themselves eliminate the tendency of the combustion space to fill up with solid material, but initiate difficulties with auto-ignition and heavy knock which loosens the deposits. J. G. H.

1851. Engine mountings and torsional vibration dampers for trucks and buses. T. H. Pierce and J. B. Robinson. *S.A.E. quart. Trans.*, Jan. 1952, **6** (1), 36–72.—The functions of, and basic design data for, engine mountings in order to obtain optimum vehicle performance are considered, and details are presented of a number of types of commercial mountings with their locations on truck and bus engines, together with an evaluation of natural rubber and synthetic compounds in this field. Types of torsional vibration dampers in general use are described and illustrated, and details are presented of a series of torsional tests on various types of engines fitted with these dampers, with discussions on the effect of significant factors. The desirability of close co-operation between rubber, petroleum, chemical, and automotive interests in promoting further developments in this field is emphasized. J. G. H.

1852. Sub-zero winterization of diesel-engine power equipment. P. W. Espenschade, R. E. Navarin, and W. W. Van Ness. *S.A.E. quart. Trans.*, Oct. 1952, **6** (4), 689–709.—Concern about possible future military operations in Arctic regions has focused attention on the necessity for an effective winterization procedure, so that every piece of general-purpose, engine-powered equipment can be capable of starting and operating satisfactorily under all weather conditions down to −25° F. Details are set out of the essential points for an effective engine winterization system, and the necessity for the designing of all adjustable devices to facilitate their handling by operators wearing heavy gloves is discussed. Special requirements in the way of lubricants, starting fluids, and cranking systems are described, and full specifications for winterization are set out in appendices. Cold starting and cranking difficulties figured largely in the discussion. J. G. H.

1853. Superchargers and their comparative performance. W. T. von der Nuell. *S.A.E. quart. Trans.*, Oct. 1952, **6** (4), 753–82.—The general functions of superchargers are briefly discussed, and the adaption of the supercharges to specific engine requirements is discussed. The main types of superchargers are discussed with design details and notes on specific applications. The effects of superchargers on engine performance are considered with particular reference to the problems of the engine plus supercharger system, and detailed descriptions of some typical supercharged industrial engines and of Brown-Boveri and M.A.N. superchargers are presented. J. G. H.

1854. Electronic engine indicators with special reference to some recent American designs. R. K. Vinycomb. *Proc. Instn mech. Engrs, Lond.*, 1951, **164** (2), 195–200.—The history of indicators for I.C. engines as adapted from those developed for the steam engine is briefly reviewed, and some early electronic devices are described. The characteristics of the ideal indicator are set out, and 4 commercially available electronic indicators (the "Electron Pressuregraph," the "Dyna-Gage," that of Brookes-Smith and Colls, and the catenary-diaphragm type) are described and illustrated in detail, with tabular data on performance. J. G. H.

1855. Patents. U.S.P. 2,619,796 (3.12.46; 2.12.52). E. G. Sterland, assr to English Electric Co. Gas turbine plant, having a dynamic compressor, for normal and high load operation, and a positive displacement compressor for low load operation.

U.S.P. 2,619,797 (20.12.48; 2.12.52). L. Haworth, assr to Rolls-Royce Ltd. A gas turbine engine, which includes a first turbine drivingly connected to a compressor, a propeller, and a second turbine drivingly connected to said propeller to drive it and a free-wheel clutch.

U.S.P. 2,619,798 (10.1.51; 2.12.52). R. Strub. Semi-closed circuit type gas turbine plant having extraction controlled by circuit turbine governor.

U.S.P. 2,619,800 (G.B. 14.11.49; 2.12.52). — Fell, assr to Fell Developments Ltd. I.C. engine power plant.

U.S.P. 2,619,830 (13.9.48; 2.12.52). R. G. Piety, assr to Phillips Petroleum Co. A detonation meter for indicating the intensity of knocking in a cyl of an I.C. engine.

U.S.P. 2,619,908 (G.B. 4.2.48; 2.12.52). F. M. Evans, assr to C.A.V. Ltd. In a liq fuel injection pump having means for regulating its output, the combination of an abutment and a contact piece which are arranged to co-operate with each other for limiting the movement of the regulating means.

U.S.P. 2,619,915 (G.B. 10.7.47; 12.12.52). R. G. Ifield and E. R. Watson, assrs to Joseph Lucas Ltd. A liq fuel injection system having in combination a fuel pump, a part formed with a fuel delivery passage, an accumulator arranged to be charged with fuel by said pump when the latter is brought into action, and a valve.

U.S.P. 2,619,918 (G.B. 3.2.48; 2.12.52). J. O. P. Hughes, assr to English Electric Co. A gas turbine locomotive having a compartment, lateral walls with air intake openings arranged longitudinally theron, laterally delimiting the cross-section of the said compartment.

U.S.P. 2,619,945 (1.9.51; 2.12.52). A. Wiseman, assr to Continental Motors Corpn. A fuel–air mixture intake system for a multi-cyl I.C. engine having a crank-case and horizontally opposed cyl.

U.S.P. 2,619,947 (G.B. 9.5.47; 2.12.52). M. C. Wilks, assr to The Rover Co. A liq fuel supply system for I.C. engines, in which the air inflow and fuel supply are appropriately correlated to suit the requirements of the engine.

U.S.P. 2,619,948 (G.B. 30.9.49; 2.12.52). G. N. Goldsmith, assr to Ricardo and Co. Decompression mechanism for reciprocating I.C. engines.

U.S.P. 2,620,123 (31.5.46; 2.12.52). W. J. Parducci, assr to Continental Aviation and Engineering Corpn. An I.C. gas turbine having a compressor and a shaft providing a bladed turbine wheel, in which air is ejected through outlet openings and conducted in close contact with the turbine wheel face.

U.S.P. 2,620,156 (9.5.46; 2.12.52). W. J. Parducci, assr to Continental Aviation and Engineering Corpn. A turbine engine assembly comprising means to concentrically locate the turbine blade rim with respect to the shaft axis.

U.S.P. 2,620,157 (G.B. 6.5.47; 2.12.52). F. W. W. Morley and T. E. G. Gardiner, assrs to Rolls-Royce Ltd. An axial flow turbine comprising structural members capable of axial movement.

U.S.P. 2,620,158 (G.B. 5.10.48; 2.12.52). A. Frankel, assr to English Electric Co. For an elastic fluid axial flow turbo-machine, an assembly, comprising a blade retaining ring and stator blades.

U.S.P. 2,620,622 (Sweden 12.5.45; 9.12.52). B. K. O. Lundberg, assr to Svenska Turbinfabriks A.B. Ljungstrom. A jet propulsion unit for aircraft, comprising an outlet passage for conducting combustion gases rearward to generate a propulsive force, and an adjustable device permitting the gases to flow through said passage in a normal retracted position of said device but deflecting the gases in an extended position through lateral passages to reduce the propulsive force.

U.S.P. 2,620,623 (France 7.2.46; 9.12.52). R. J. Imbert, assr to Société Rateau. Fluid directing device for reaction jet nozzle.

U.S.P. 2,620,624 (27.9.46; 9.12.52). G. F. Wislicenus, assr to Packard Motor Car Co. Jet propulsion unit with thrust increaser.

U.S.P. 2,620,625 (16.5.47; 9.12.52). E. A. Phaneuf. Jet engine having an air compressor driven solely by a fuel gas turbine.

U.S.P. 2,620,626 (Sweden 1.9.44; 9.12.52). A. Lysholm. A propulsion unit for aircraft, including a casing having a gas turbine, a combustion chamber, and an air compressor therein, and means for controlling the discharge of air through bleed openings.

U.S.P. 2,620,627 (26.7.46; 9.12.52). R. M. Nardone, assr to J. J. Mascuch. Gas-driven engine starting motor using solid fuel cartridges.

U.S.P. 2,620,782 (29.11.49; 9.12.52). H. J. Stegeman, assr to Locke Steel Chain Co. Air intake stack for air-cooling of I.C. engines.

U.S.P. 2,620,783 (16.3.46; 9.12.52). L. Lee, assr to Niles–Bement–Pond Co. A control apparatus for an I.C. engine, comprising a conduit for air flowing to said engine and a pair of throttle blades for controlling the flow of air through said conduit.

U.S.P. 2,621,029 (31.1.48; 9.12.52). J. T. W. Moseley, assr to Carter Carburetor Corpn. Two-fuel carburettor.

U.S.P. 2,621,030 (26.8.49; 9.12.52). O. Henning, assr to Carter Carburetor Corpn. Carburettor nozzle system.

U.S.P. 2,621,031 (23.10.48; 9.12.52). G. S. Gonzalez and C. S. Gonzalez, assrs to J. D. Lavin. Carburettor with diffusion and distribution chambers.

U.S.P. 2,621,472. S. M. Udale, assr to G. M. Holley and E. Holley. A control for an I.C. engine having an exhaust turbine and a supercharger driven by said turbine.

U.S.P. 2,621,474 (Netherlands 10.2.50; 16.12.52). A. A. Dros and A. Koopmans, assr to Hartford National Bank and Trust Co. Multitube heater for hot gas reciprocating engines.

U.S.P. 2,621,475 (13.6.46; 16.12.52). J. W. Loy, assr to Phillips Petroleum Co. A multi-stage combustion gas turbine in which fuel is combusted first by admixing a fluid fuel with air in an inert diluent gas in an initial combustion zone and burning the fuel therein.

U.S.P. 2,621,476 (France 29.3.47; 16.12.52). H. M. L. Sedille, assr to Société Rateau. Gas turbine installation operating on gaseous fuels.

U.S.P. 2,621,477 (G.B. 10.10.49; 16.12.52). G. J. Powter and P. L. Farnham, assrs to Power Jets (Research and Development) Ltd. Combustion apparatus having valve controlled passages for preheating the fuel–air mixture.

U.S.P. 2,621,630 (G.B. 9.2.49; 16.12.52). R. J. Ifield, assr to Joseph Lucas Ltd. Fluid-operated means for regulating the supply of liq fuel from a pump to a prime mover.

U.S.P. 2,621,632 (G.B. 3.11.49; 16.12.52). R. J. Ifield, assr to Joseph Lucas Ltd. Liq fuel control mechanism for I.C. prime movers.

U.S.P. 2,621,640 (20.1.43; 16.12.52). F. C. Reggio. Engine valve actuating mechanism having hydraulically operated valves means for controlling the valve overlap.

U.S.P. 2,621,642 (20.4.48; 16.12.52). E. A. Mallick, assr to Phillips Petroleum Co. In a fuel metering system, in combination, a valve for regulating the fuel–air ratio of a fuel mixture to be fed to an I.C. engine, means for sensing detonation in a cyl of said engine, means for sensing engine temp, and a control unit for said valve.

U.S.P. 2,622,391 (22.4.46; 23.12.52). C. A. Lindeman. The combination, with an I.C. engine having an intake manifold and an exhaust manifold, of a valve in each manifold, a double acting fluid pressure device for operating each valve, means for supplying predetermined pressure to one end of each said device, and a pressure connexion.

U.S.P. 2,622,393 (19.7.45; 23.12.52). M. A. Edwards, D. E. Garr, and H. M. Ogle, assrs to General Electric Co. Fuel regulating apparatus for aircraft gas turbine power plants.

U.S.P. 2,622,394 (11.1.50; 23.12.52). T. B. Murdock and R. H. Ball, assrs to General Electric Co. Centrifugal balance fuel valve for rotating combustion products generators.

U.S.P. 2,622,395 (G.B. 6.1.48; 23.12.52). A. T. Bowden, assr to C. A. Parsons and Co. Ltd. In a combustion system for gas turbines, a passageway in the fuel atomizer for cooling air, a conduit from the compressor to the passageway, and a heat exchanger comprise a circuit connected into the conduit.

U.S.P. 2,622,396 (G.B. 26.11.48; 23.12.52). J. S. Clarke and E. S. Collinson, assrs to Joseph Lucas Ltd. Fuel vaporizing apparatus for an afterburner.

U.S.P. 2,622,570 (Germany 15.3.49; 23.12.52). F. K. H. Nallinger, assr to Daimler-Benz A.G. Diesel engine with precombustion chamber, comprising a sliding piston, and a connexion channel between the precombustion chamber and the main combustion chamber.

U.S.P. 2,622,571 (G.B. 2.2.50; 23.12.52). H. R. Fehling and G. Friedlander. A method of operating an I.C. engine to afford increased power by the addition of oxygen and extra fuel to the charge.

U.S.P. 2,622,579 (G.B. 12.7.43; 23.12.52). H. Weslake. A cyl head for an internal combustion engine having a cyl, said head being formed with a combustion chamber and having inlet and exhaust valve seats.

U.S.P. 2,622,843 (17.12.47; 23.12.52). R. M. Williams, assr to Packard Motor Car Co. In a turbo-jet engine, separate inner and outer casing structures provide an annular nozzle for conducting the power stream to the turbine.

U.S.P. 2,623,356 (France 17.5.48; 30.12.52). H. Coanda. Turbo-jet engine having jet pump and rotary compressor means to reduce turbine exhaust pressure.

U.S.P. 2,623,357 (6.9.45; 30.12.52). R. Birmann. Gas turbine power plant having means to cool and means to compress combustion products passing through the turbine.

U.S.P. 2,623,468 (15.4.48; 30.12.52). G. Steven and R. R. Fruehauf, assrs to Worthington Corpn. In a fuel injection pump, a housing having first and second bores of different diameters, plungers reciprocally mounted in the bores, the housing provided with suction passages for oil opening through suction openings into each of the bores. D. A. R.

MISCELLANEOUS

1856. Will world crude prices take drop? R. E. Spann. *Petrol. Refin.*, 1953, **32** (6), 184–7.—A discussion of possible changes in crude prices due to the surplus productive and refining capacity now that the world demand is increasing more slowly. Particular attention is paid to the Middle East, the most important producer outside the U.S., where minor price reductions have already occurred. R. D. S.

1857. Exploratory operations and petroleum production in overseas territories of the French Union. M. Lowenstein. *Erdöl u. Kohle*, 1953, **6**, 210.—Brief notes on activities of operating companies, mainly located in North Africa. Estimated 1952 production (tons) is: Algeria, 60,000; Morocco, 110,000. V. B.

1858. New drum heater. Anon. *Sci. Lubric.*, Feb. 1953, **5** (2), 24.—Details are presented of the Stabilag drum heater, which incorporates a radiant heater of the infra-red type, can be tailor-made to fit any type of barrel or even fit a pipe, and has a temp range up to 700° C with thermostatic control. J. G. H.

1859. The stores organization in an overseas oilfield. D. S. Curtis. *Inst. Petrol. Rev.*, 1953, **7** (78), 181.—A detailed description is given of the various stages of the stores organization of the Kuwait Oil Co., starting with the Purchase and Supply Branch in London, passing on to transport, then to storage, and ultimately, the transfer to consumer. All the concomitant difficulties of identification, classification and indexing, and storage are considered. R. H.

BOOK REVIEWS

Petroleum Production Engineering Oil Field Exploitation. Lester Charles Uren. Third Edition. New York: McGraw-Hill Book Co. Inc., 1953. Pp. xiii + 807. $10.00.

This book, which is the middle volume of a series of three covering petroleum Engineering in a wide sense, is devoted to the engineering methods involved in the production of oil from the drilled and developed field. The processing of oil and gas for pipeline and other forms of transportation, gathering, shipping, storage, and management are also covered.

The other two volumes have dealt respectively with development—that is, oil finding and oil well drilling—and oilfield economics. "Oilfield Exploitation," as now published in its third edition, has been re-arranged to permit of a more fitting segregation of material between the three companion volumes.

In his preface the author states that it is his primary purpose to serve the needs of the engineering student in his first survey of modern trends in petroleum engineering, and it is the reviewer's opinion that he has succeeded in a most marked manner.

The body of the treatise is presented with clarity and brevity, and it has thus been possible to cover essential principles and all the more important practices and equipment at present used to win oil. The first three chapters deal with the oil and gas reservoir, principles governing drainage, and production characteristics of oil and gas wells.

The next seven chapters are devoted essentially to practices involved in operating flowing wells, pneumatic and mechanical lifts in their several forms, power development and application, efficiency considerations (maximum recovery), secondary recovery by gas injection and water flooding, and "mining" practices.

The next four chapters concern field processing of oil and gas—that is, their preparation for acceptance into pipelines, gathering, storage, and transportation.

The final chapter deals with auxiliary services, plants, and buildings.

At the end of each chapter there is a well selected bibliography to direct the reader to more detailed studies. Name and subject indices are appended at the end of the book. There are many graphs, figures, and photographs, which have been well selected, the diagrams being clear and the equipment photographed typical of modern trends.

Little criticism can be made of this work, which has been accepted as one of the foremost of its class in earlier editions. In common with nearly all works on oilfield practice emanating from the U.S.A., there is an absence of material dealing with the somewhat unique conditions present in the Middle East oilfields. Admittedly the number of readers likely to be interested in Middle East operations is small, but a need does exist for more information on this important and fast developing area which the author might feel it justifiable to satisfy in the future. E. C. S.

Decimal System for Classifying Data Pertaining to the Petroleum Industry. Lester C. Uren. Berkeley: University of California Press, 1953. London: Cambridge University Press. Pp. 94. $2.50 and 19s.

It has long been recognized that unless bibliographical material is classified and filed so that it can be readily consulted, it is without value. It is also essential that the system of classification chosen is such that all references to the literature of a subject and its various aspects are placed together and in relation to other similar subjects, and that it is quick and simple to use and understand.

In regard to the whole field of science and technology there are two main systems based on a decimal system—the Dewey and the Universal. Excellent as these may be for their purpose, when applied to a specialized library devoted to one

industry they are too broad in character and do not permit of the fine division needed to trace bibliographical references to detailed operations or processes.

It is now 25 years since Professor Uren's system was first published by the National Petroleum Co. in the U.S.A. Ten years later—in 1938—it was published in serial form in *The Petroleum Engineer* and later as a booklet. In the intervening period, the petroleum industry has expanded greatly, and technical developments have been wide. Therefore, the author of the classification has found it necessary to extend it to meet this expansion, an extension which can readily be made at any time without disrupting the existing notations.

The Uren classification has the advantage that it is simple to operate and logical in its lay-out. G. S.

Merchant Ships—British Built 1952. Compiled by Colin Stewart. Southampton: Adlard Coles Ltd (in assoc. with George Harrap), 1953. Pp. 232. 30*s*.

This volume should serve a very useful purpose, particularly to those engaged in the shipping and shipbuilding industry.

The technical foreword is an excellent summation of the trends in ship's design during 1952, and the principle of collating the various illustrations and statistics facilitates matters for the reader, who would otherwise need to make reference to various periodicals from which some of the information has been incorporated.

The inclusion of notes on technicalities, such as tonnages and dimensions, is a particularly good idea, although the reference on "exemptions" at the end of the paragraph on "gross tonnage" is considered to be inappropriate for present-day conditions, and could well be omitted.

The "Illustrated Register," giving full particulars of ships completed in Great Britain and Northern Ireland during 1952, together with separate reviews on types, ownership, and builders, is of special interest, as are also the plans showing representative vessels for individual classes of trade.

Other useful features are detailed particulars of sales of British ships and of salient casualties.

The shipbuilding statistics, which include launchings and vessels under construction throughout the world and which have been reproduced from Lloyd's Register, should be of especial value to those engaged on the speculative pastime of crystal gazing.

An inventory of the world's merchant fleet by nationality and size groups, also reproduced from Lloyd's Register, would be strengthened if it was to show the tonnage by types, *i.e.*, liners, tankers, etc.

There appear to be certain discrepancies. For instance, on p. 18, the Anglo-Saxon Petroleum Co.'s new gas turbine tanker is described as twin-screwed, whereas on p. 23 reference is made to the same ship as a single-screw vessel which latter information is confirmed by the prospective owners. Likewise, on p. 27, the length between perpendiculars and the length "L" of Lloyds dimensions are not strictly one and the same thing. Matters like this, together with minor spelling mistakes, give room for greater accuracy in the next volume. A. A. W.

ADDITIONS TO THE LIBRARY

ASTM Standards on Electrical Insulating Materials. Philadelphia, Pa.; ASTM, 1953. Pp. 574 + xiv. $5.25.

The 1953 edition of the ASTM standards on insulating materials covers 56 test methods, 16 specifications, 2 recommended practices—including one for purchase of uninhibited mineral oil for use in transformers and in oil circuit breakers—and 1 list of definitions. Eleven test methods relate to mineral oils and one to hydrocarbon waxes.

ASTM Manual on Measurement and Sampling of Petroleum and Petroleum Products. 2nd edn. Philadelphia, Pa.; ASTM, 1953. Pp. 133 + x. $1.50.

This publication incorporates seven ASTM standards, with the addition of explanatory and descriptive material, covering gauging (D 1085-52T), temperature measurement (D 1086-52T), volume calculations and corrections (D 1087-52T), water and sediment (D 96-52T), gravity (D 287-52), sampling (D 270-52T), and sampling natural gas (D 1145-50T).

British Standards 1953 Yearbook. London: BSI, 1953. Pp. 488. 12*s.* 6*d.* net.

The extent to which standardization and simplication have grown is indicated by the current issue of the BSI Yearbook. Complete to the end of March 1953, this contains information concerning over 2000 British Standards. The subject index covers, in 48 closely printed pages, the wide variety of the Standards—from abbreviations to zinc roofing.

Details are also given of the Councils and Industry Committees.

Cracking Catalyst Activity in the Presence of Hydrogen Sulphide. H. A. Dirksen, H. R. Linden, and E. S. Pettyjohn. Institute of Gas Technology Research Bulletin 4. Chicago, Ill.: Institute of Gas Technology, 1953. Pp. 28 + iv. $3.50.

The results of a search for a sulphur-resistant catalyst for the catalytic cracking of natural gas and other low molecular weight hydrocarbons are presented. Nickel was found to be the most promising catalyst for the steam–propane reaction, followed by molybdenum, and it was shown that mixed catalysts had no greater activity than that of the higher activity component.

1953 SAE Handbook. New York: Society of Automotive Engineers, 1953. Pp. 1032.

Of particular interest to the petroleum industry are the SAE viscosity numbers for motor lubricants. The only change noted is for the transmission and axle lubricant classification, in which for SAE 75, 80, 90, and 140 the requirement regarding consistency is now omitted.

The book contains a mass of information and specifications of materials of construction for use in the automobile industry.

Fuel Research 1952. Department of Scientific and Industrial Research. London: HMSO, 1953. Pp. 56 + iv. 2*s.* 6*d.*

The 1952 report of the Fuel Research Board includes also the report of the Director of Fuel Research, and this summarizes the work in progress at the Fuel Research Station, Greenwich. It contains much of interest to the petroleum industry, and in particular deals with the Fischer–Tropsch synthesis, the flow properties of residual fuel oils, the removal of sulphur from fuel oils, and the separation of fuel oil–seawater emulsions.

Financial Analysis of 30 Oil Companies for 1952. Frederick G. Coqueron. New York: Chase National Bank, 1953. Pp. 32.

References to Scientific Literature on Fire. Pt. V. 1951. Miss E. M. Shakeshaft, Miss K. C. Stringer, Miss B. F. W. Baxter, and Miss I. G. Wolanska. Boreham Wood, Herts: Joint Fire Research Organization, 1953. Pp. 60.

ICI Engineering Codes & Regulations. Group C (Electrical). Vol. 1.3. Plant Installations. London: ICI, 1953. (Obtainable from Royal Society for Prevention of Accidents, 38 Millbank, London, S.W.1.) Pp. 85.

British Standards. British Standards Institution.

B.S. 615: 1953. Kohlrausch Masks. Pp. 9. 2*s*. 6*d*. net, post free.

B.S. 748: 1953. Haenacytometer Counting Chambers and Dilution Pipettes. Pp. 18. 3*s*. 6*d*. net, post free.

B.S. 1887: 1953. Weighing and Height-Measuring Machines. Pp. 11. 2*s*. 6*d*. net, post free.

B.S. 1924: 1953. Methods of Test for Stabilized Soils. Pp. 109. 12*s*. 6*d*. net, post free.

B.S. 1969: 1953. Performance Characteristics of Sintered Filters. Pp. 13. 2*s*. 6*d*. net, post free.

B.S. 1983: 1953. Accuracy of Chucks for Lathes and Drilling Machines. Pp. 24. 4*s*. net, post free.

B.S. 1987: 1953. Diamond Powder in the Sieve and Sub-Sieve Ranges. Pp. 9. 2*s*. 6*d*. net, post free.

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Oilfield Exploration and Exploitation

Geology

1860. The Middle East oil fields. J. Flandrin. *Rev. Inst. franç. Pétrole*, March 1953, **8** (3), 90–104.—There have been 2 main periods of oil discovery in the Middle East: an early period when the foothill fields were found, and a later period when those of the Arabian platform were opened. The geology of each of these main areas is described, with special reference to the structure, source, reservoir, and cap rocks. There is brief reference to the mode of search for the fields in the 2 provinces.

Short descriptions are given of all the developed fields. Data on production and reserves are tabulated. A map shows the ownership of the various concessions, and the participants in the different companies are given. Maps and cross-sections are included. G. D. H.

1861. Palæogeography and tectonics of the pre-Aptian Mesozoic in Bas-Languedoc, Causses, and west Provence. M. Gottis. *Rev. Inst. franç. Pétrole*, Nov. 1952, **7** (11), 395–406.—The search for oil by SNPLM required a detailed investigation of the geology of the general Languedoc area, and a series of deep wells added to the knowledge of the subsurface formations and structures. Some of the drilling was for the Trias because of the promising features shown by the outcrops of this formation. The geological history and nature of the formations are described, and the discussion of the structure is illustrated by a series of cross-sections. There is evidence that the structure of the deep formations differs from that of the shallow beds. Broadly, the former is less complex than the latter, and the change takes place mainly through the plastic Triassic beds.

The Jurassic and Cretaceous beds were investigated by drilling, but the search for oil in the Mesozoic was eventually abandoned and attention turned to the Tertiary. G. D. H.

Drilling

1862. Method of perforating casing below tubing. M. P. Lebourg and G. R. Hodgson. *J. Petrol. Tech.*, Dec. 1952, **4** (12), *AIMME Tech. Paper No.* 3459, 303–10.—In a new type of completion, the casing is set through the producing zone, and open-ended tubing run to replace the mud with oil or water, the amount of "cushion" being varied according to the expected bottom hole pressure. The bottom of the tubing is placed above the zone to be perforated, and all surface fittings installed, after which the drilling rig can be moved off. The perforating gun is run through the tubing, depths being correlated with casing collars, and, after firing, the gun falls to pieces at the bottom of the well. The gun uses shaped charges designed to produce a large hole directed upwards at 45°. 5 shots per foot are placed spirally in an aluminium carrier of 1¾ inches outside dia. All charges are fired simultaneously. By changing the size of the carrier or the type of material, pressures up to 9000 p.s.i. can be handled.

Field performance has sometimes exceeded expectations, and possibly the oblique shooting may fracture the cement when there is a loose sand backing.

The magnetic casing collar locator also shows the tubing end and joints. A coil is placed between two opposed magnetic circuits. Disturbed balance due to collars, etc., produces a transient current in the coil.

Tubing should be set at least 10 ft above the zone to be perforated. If possible, the hydrostatic head should be less than the formation pressure.

Details are given of the procedure for preparing new wells and workovers for perforating, and the shooting operation is described. The max length of carrier used to date is 31 ft. 400 successful completions have been made by this technique, and in many cases the wells have had higher potentials than those completed conventionally. There should be no contamination of the formation after perforating. The gun is designed for use with 5½-inch casing. G. D. H.

1863. Use of activated charcoal in cement to combat effects of contamination by drilling muds. B. E. Morgan and G. K. Dumbauld. *J. Petrol. Tech.*, Sept. 1952, **4** (9), *AIMME Tech. Paper No.* 3396, 225–32.—High early strength, normal Portland, and slow set cements have been tested for tolerance of contamination by untreated mud without loss of ability to develop strength in a reasonable time. All developed sufficient one-day strength to give a satisfactory set cement with up to 30% admixture of mud. Treated field muds and laboratory-prepared muds with known amounts of caustic-quebracho or starch were also used in the tests. Field muds were found to affect the muds seriously. For laboratory-treated muds, much caustic-quebracho markedly reduced the cement strength. The same was true of starch muds.

There are several types of slow set cements, and two additive-type cements failed to set under conditions of contamination which permitted reasonable strength in one straight slow set cement and one additive type.

It was found that the higher the curing temp the less weakening of the cements arose from contamination. Caustic-quebracho seems to retard setting without necessarily reducing ultimate strength.

Various materials were tried as additives to combat the treating materials in muds. These included slaked lime, activated charcoal, special contact clays, bauxite, synthetic resins, silica gel, and diatomaceous earth. The first 3 showed most promise. Charcoal did not reduce the cement thickening time. It seems that about 5% of charcoal may be most satisfactory in combatting the action of caustic-quebracho muds in retarding cement strength development. Muds with fermented starch and those treated with calcium ligno-cellulose were also satisfactorily handled by using charcoal. The slow-setting property of some additive-type slow set cements was impaired by adding charcoal.

Activated charcoal has been successfully used in 2 field jobs involving setting cement plugs, after failures with ordinary cement. G. D. H.

1864. The problem of fluid leakage. D. F. Denny. *Fluid Handl.*, March 1953, **38**, 62; April 1953, **39**, 92.—The characteristics of 5 packing materials for sealing against reciprocating and rotating shafts are compared. Typical designs for these duties are given, and practical experiences are quoted to assist selection of a suitable seal. D. H.

1865. Patents. U.S.P. 2,633,916 (12.1.48; 7.4.53). R. C. Baker and J. R. Baker, assrs to Baker Oil Tools. In cementing apparatus: a tubular member having a side port and adapted to form part of a conduit string positionable in a well bore; a shiftable sleeve valve member on the exterior of the tubular member disposed initially in an elevated position along the tubular member to allow fluid passage through the port; and hydraulically operable means operatively engaging the valve member for shifting the valve member downwardly along the tubular member to port closing position.

U.S.P. 2,633,917 (13.9.48; 7.4.53). R. C. Baker and B. Zimmerman, assrs to Baker Oil Tools. In a well tool for use in a well conduit: a first member adapted for connexion to a tubular string; a second member slidably and telescopically arranged with respect to the first member; means for transmitting the turning effort of the first member to the second member; conduit engageable means operatively connected with the second member for resisting movement of the second member in the well conduit; and means, comprising a left-hand threaded connexion between the conduit engageable means and one of the members, for moving at least part of the conduit engageable means longitudinally of the members and the well conduit in response to rotation of the first member to a position enabling rotation of the first and second members without dragging the conduit engageable means along the inner surface of the well conduit.

U.S.P. 2,633,918 (2.9.50; 7.4.53). R. K. Le Rouax, assr to Oil Center Tool Co. A well packer device and anchoring means therefor.

U.S.P. 2,633,919 (19.6.48; 7.4.53). R. F. Bauer and J. E. Sherborne, assrs to Union Oil Co of California. A process for improving the production of oil from an oil-bearing formation.

U.S.P. 2,634,099 (10.10.46; 7.4.53). C. M. O'Leary. A power transmission system for use in rotary well drilling.

U.S.P. 2,634,100 (16.12.50; 7.4.53). C. M. O'Leary. A kelly drive bushing which comprises an upper squared section, a lower downwardly tapering section, and a centring device intermediate the upper and lower sections.

U.S.P. 2,634,101 (8.7.49; 7.4.53). C. M. O'Leary. Apparatus for the rotary drilling of oil wells, including the combination of a rotary drill system, a drill bit carried by the drill stem, and an annular sleeve fitted in the drill stem.

U.S.P. 2,634,102 (6.9.49; 7.4.53). C. M. Howard. A longitudinally-striking oil well jar.

U.S.P. 2,634,105 (25.11.49; 7.4.53). H. Gruner. A drilling bit including a body, 4 spindles carried by the body, conical cutters on the spindles extending substantially to the vertical axis of the bit and adapted to revolve on the spindles, and wedge-shaped teeth on each cutter.

U.S.P. 2,634,236 (30.4.51; 7.4.53). E. K. Simon and H. Fischer, assrs to Lorum Fibre Co. A process for correcting lost circulation of drilling fluid during drilling of a petroleum well bore.

U.S.P. 2,634,682 (27.7.50; 14.4.53). W. H. Dye. A power unit for oil well pumps and the like.

U.S.P. 2,634,951 (1.9.49; 14.4.53). R. E. Snyder, assr to Snyder Oil Tool Corpn. A rotary impact drill for earth boring.

U.S.P. 2,634,953 (13.12.48; 14.4.53). J. C. Stokes, assr to Reed Roller Bit Co. A slush nozzle unit for drill bits.

U.S.P. 2,634,955 (15.5.50; 14.4.53). J. S. Johnson. A drill bit assembly.

U.S.P. 2,634,956 (7.3.51; 14.4.53). J. C. Stokes, assr to Reed Roller Bit Co. The combination with a removable core barrel of a drill bit.

U.S.P. 2,635,697 (29.6.49; 21.4.53). G. E. Cannon, assr to Standard Oil Development Co. Apparatus for introducing cementitious material in a well bore.

U.S.P. 2,635,349 (2.12.50; 21.4.53). P. M. Green, assr to Socony-Vacuum Oil Co. A well-surveying system, comprising balanceable circuit means adapted for lowering into a well, and including impedance means variable in response to inclination of the well from the vertical.

U.S.P. 2,635,852 (5.12.46; 21.4.53). R. E. Snyder, assr to Snyder Oil Tool Corpn. Impact drill.

U.S.P. 2,635,853 (28.12.48; 21.4.53). W. S. Crake, assr to Shell Development Co. A jarring tool adapted to be lowered on a cable within a tubular string in a well.

U.S.P. 2,635,914 (21.2.48; 21.4.53). C. P. Young. Fishing tool.

U.S.P. 2,636,383 (23.1.48; 28.4.53). K. R. More and W. G. Middleton, assrs to Phillips Petroleum Co. Well bore measuring and fluid metering device.

U.S.P. 2,636,561 (24.1.48; 28.4.53). H. W. Harrison. A well gun.

U.S.P. 2,636,563 (12.3.48; 28.4.53). D. O. Rollins, assr to Getty Manufacturing and Tool Co. Oil well finishing tool.

U.S.P. 2,636,857 (7.6.51; 28.4.53). W. E. Bergman, assr to Phillips Petroleum Co. A method for reducing the visc of a water base drilling mud having a pH above 7.

D. A. R.

Production

1866. Drainage and recovery of oil. P. Albert. *Rev. Inst. franç. Pétrole*, March 1953, **8** (3), 82–9.—There are no particular reasons for believing that the amount of irrecoverable oil is an intrinsic characteristic of the reservoir. In 1924 Cutler stated that

well recoveries were approx proportional to the square roots of the drainage areas when there was interference in a reservoir producing by expansion. Dense drilling leads to regional migration from areas of wider spacing. The main supporters seem to have been the advisers of small producers, interested in rapid returns from their leases and not concerned with technical efficiency.

Craze and Buckley studied the performance of 103 fields, 76 operating under water drive and 27 by expansion. In the former group, spacing ranged from 2·65 to 65·6 acres/well, and 70 reservoirs were sandstones. Attempts were made to eliminate the effects of certain factors, and it was concluded that there was no marked relation between spacing and recovery. However, many of the fields were far from exhausted, and so the final recoveries were not known with certainty.

Since 1945 attempts have been made to deal with the problem on the basis of equations relating to flow in porous media. Simplifying assumptions are necessary, and these are not justifiable for all reservoirs. For gas reservoirs, recovery is independent of spacing, and spacing is purely a matter of economics. Oil reservoirs producing by expansion have some analogies with gas reservoirs. The similarity is closest for the single-phase condition when the bottom-hole pressure is above the bubble point. Medium spacing may be necessary below the bubble point to avoid gas channelling. 40-acre spacing is common. Good results have been obtained with 20-acre spacing in water-drive fields in homogeneous reservoirs. Note must be taken of secondary water drive or repressuring. In fissured beds 10 acres may be used, and in thin beds the water advance may be kept regular by alternate production and rest. G. D. H.

1867. Pressure performance of five fields completed in a common aquifer. W. D. Moore and L. G. Truby. *J. Petrol. Tech.*, Dec. 1952, **4** (12), *AIMME Tech. Paper No.* 3460, 297–302.—The Embar, Martin, TXL, and Wheeler fields have been found to contribute significantly to the pressure drawdown at Andector in West Texas. These fields are on the Central Basin Platform. Oil production is from highs in the Ellenburger, which is highly fractured, with vugs and solution channels in a dense dolomite matrix. Well productivities are high, and pressure communication in the fields is generally good. Previously the fracturing had been assumed to occur only on the local highs. Matrix permeability is low, yet a survey of drill-stem test and other data suggests appreciable communication between the fields.

Attempts were made to match the pressure performance of the 5 fields on the electric analyser water-drive unit by considering each field separately, and withdrawing production from all the fields at the appropriate point on the water-drive network. Fair matching was obtained for Andector, Embar, and Martin. The pool unit on the analyser was then used, and the special points in applying this analogue are noted. By trial and error, boundaries of pressure communication were selected which were compatible with geological data, and allowed simultaneous pressure performance history matching for all 5 fields. The boundaries could be due to faulting or to porosity or permeability pinch-outs. The influence on one field of all the others was calculated, and at Andector only 230 p.s.i. of the total drop of 810 p.s.i. was estimated to be due to production at Andector. The pressure pattern at the beginning of 1952 was calculated, and a mean permeability of 50 mD is suggested in an area some 35 miles by 20 miles. The pressure in a new discovery agreed quite well with the predicted pressure pattern. G. D. H.

1868. A study of the laws governing the relationship between reserves and producing rate as applied to U.S.A. J. Nougaro. *Rev. Inst. franç. Pétrole*, Dec. 1952, **7** (12), 463–73.—From a study of American statistics it is concluded that the mean life of U.S. fields had grown to about 28·5 yr in 1949, and, after allowing for decline in late years and build-up, it is assumed that mean period of constant production may be 25 yr. 2 yr are allowed for each field before this constant output is attained. On the basis of these simple assumptions it is shown that from the 27th yr onwards the reserves will be 14 times the annual production.

In the second case the production is assumed to grow according to a geometrical progression, and for a factor of 1·05 the reserves at any time will be equal to 17·4 times the year's output. The figure will increase as the factor increases. If, however, the mean life of the field is 20 yr, not 25 yr, the factor 1·05 will give a reserve figure of 13·8 times the year's production.

In the third case the production is assumed to grow according to an arithmetic progression. From the 27th yr the reserves will be a linear function of the production, and the annual discoveries are also a linear function of the production. The ratio exceeds 14.

The data do not warrant the selection of either an arithmetical or geometrical law for the U.S.A. The law may lie between these two. G. D. H.

1869. Oil production in the territory of Yugoslavia before the first world war. B. Horvat. *Nafta* (*Yugoslavia*), April 1953, **4**, 120–8.—The evolution of Yugoslavian oil and gas industry is not well known, but the industry has 100 years of history. The oil seepages on Yugoslavian territory were mentioned in 1788, and from this year dated Prof. Winterl's descriptions of oil seepages near Peklenica in Medumerje. The farmers of Peklenica produced oil by digging trenches and collecting the seepage, which they used as medicine and cart grease. In 1855 the oil producers got the first claims for oil production at Mikleuska and Petrovo Selo in Croatia, but the actual history of the industry began in 1886 with first drilling for oil in Medumerje near old seepages. In this article the period up to 1906 is described. This period of development has 3 phases: the first, before 1884, represents phase of mining for oil; the second, 1885–89, when besides hand-dug wells, the first 15 drillings took place in various parts of the country in Medumurje, Croatia, and Bosnia; and the third phase from 1900 to 1906, when the first greater quantities of oil were produced. This production developed almost entirely on the Selnica field in Medumurje. The production from Medumurje fields, which started in 1886, still continues. (Author's Abstract.)

1870. Surface area measurements on sedimentary rocks. C. S. Brooks and W. R. Purcell. *J. Petrol. Tech.*, Dec. 1952, **4** (12), *AIMME Tech. Paper No.* 3458, 289–97.—Surface area measurements have been made on a series of sedimentary rocks by the low-temp gas adsorption method, details of which are given. For sandstones the areas ranged 0·5 to 6 sq. m/gm, and for limestones 0·05 to 0·5 sq. m/gm. The limestone porosities were generally lower than the sandstone porosities, and comparison of the surface areas on the basis of unit pore volume yielded similar ranges for the 2 rock types.

The reproducibility of the measurements was fair to good, and nitrogen and argon yielded similar values.

Capillary pressure measurements with mercury gave rock textural factors of 8 to 40 for the sandstones; unconsolidated glass bead packs had values of 3 to 4. These textural factors were used in the Kozeny equation to calculate surface areas from the porosity and permeability data. For the bead packs the area so calculated agreed well with the surface area of the beads, and, in a case where the gas adsorption method was applied, with the area so determined. In sandstones, the Kozeny areas were found to be much smaller than the gas adsorption areas. This suggests that lack of uniform pore size in rocks may limit the application of the Kozeny equation.

G. D. H.

1871. Slip velocity of gases rising through liquid columns. N. Stein, E. B. Elfrink, L. D. Wiener, and C. R. Sandberg. *J. Petrol. Tech.*, Sept. 1952, **4** (9), *AIMME Tech. Paper No.* 3394, 233–40.—The design of a suitable gas anchor to prevent gas-locking in pumping wells involves knowledge of the difference in free gas rise velocity and downward oil travel to the pump intake. This is the gas slip velocity. Accordingly the slip velocities of gases through static liq columns have been investigated. Gas was bubbled through the liq column and the slip velocity calculated from the rise in the level of the liq in the column. 15-ft glass columns of 2, 3, and 4 inches dia were used. The insertion of solid rods allowed the behaviour in annuli to be studied, and one tube was also inclined. Water and several types of oil were employed. It is estimated that the mean slip velocities recorded represent the slip velocity of over 99% of the gas present. Natural gas, air, and propane were the gases. Gas rates ranged from 0·0187 to 39·366 M. cu. ft/day. Gas rate and tube dia were the dominant factors in determining slip velocity. At a given gas rate the slip velocity increased with reduction in tube dia, the change being greater the higher the rate.

An empirical correlation relates slip velocity with gas rate, tube size, ratio of liq density and visc, and tube inclination. G. D. H.

1872. Electrical resistivity measurements on reservoir rock samples by the two-electrode and four-electrode methods. C. F. Rust. *J. Petrol. Tech.*, Sept. 1952, **4** (9), *AIMME Tech. Paper No.* 3397, 217–24.—In the 2-electrode system the rock is placed between 2 metal discs, and the potential drop and current are measured. The 4-electrode system has end plates as current electrodes, and 2 probes along the sample to measure the potential drop. The latter method utilizes a smaller vol of the sample than the former, which itself may suffer from high contact resistances. This trouble has been made negligible by painting the ends of the specimen with conducting silver paints.

The apparatus employed had current electrodes on a ball-and-socket joint, and 2 sets of 6 solid silver potential electrodes were distributed along the core circumference. A combined interstitial water and resistivity cell was used for resistivity measurements during capillary desaturation. Tests for contact resistances at the probes can be applied. 60 samples were tested by both methods. Brine saturations ranged from 91·4 to 100%. For homogeneous samples the results of the 2 methods agreed well, but small differences were observed with heterogeneous samples.

In measuring the saturation exponent n, resistivity values at both equilibrium and non-equilibrium brine saturations may be employed.

It appears helpful to use both 2- and 4-electrode measurements as a check.

G. D. H.

1873. Method of predicting the tendency of oil field waters to deposit calcium carbonate. H. A. Stiff and L. E. Davis. *J. Petrol. Tech.*, Sept. 1952, **4** (9), 213–16.—At certain values of pH, water deposits calcium carbonate, which combines with iron, giving a hard crust which inhibits corrosion; at other values, the carbonate is dissolved, making the seal porous and leading to electrolytic corrosion. $SI = pH - pCa - pAlk - K$, where SI is stability index (negative for corrosion), pCa is the negative logarithm of the Ca concn, $pAlk$ the negative logarithm of the total alkalinity and K a constant dependent on the total salt concn and temp. This has been used for water with total solids up to 4000 p.p.m.

At equilibrium, $K = pH - pCa - pAlk$, and K can be measured for various salt contents and temp. Allowance was made for different salts by substituting ionic strength for total salt concn. $\mu = 0{\cdot}5\ (C_1V_1^2 + \ldots\ldots C_nV_n^2)$, where C is the concn of each ion (gm-ions/1000 gm of solvent) and V is the valency of the ion.

Curves were plotted relating K and μ for equilibrium at different temp. Curves are given which relate p.p.m. of Ca, CO_3, and HCO_3 with pCa and $pAlk$.

K diminishes as the temp rises showing increased scaling tendencies. The stability index indicates future, not past behaviour of the water. There may be several states of equilibrium for water between the formation and well-head, making possible scale formation at one point and corrosion at another.

G. D. H.

1874. Improved production by chemical treatment in Gulf Coast areas. B. Aulick, H. F. Hopkins, F. Saye, and W. Hower. *J. Petrol. Tech.*, Sept. 1952, **4** (9), 13–16.—Many producing zones in the Gulf Coast area have relatively high natural permeability and reservoir pressure, but some wells are disappointing on completion. Generally, these sands contain bentonite type clay, and this swells on contact with mud filtrate. Excessive pressure created during drilling and in running casing often force much drilling fluid into the formation. Formation fines and interstitial water may accumulate near the well bore, thereby reducing production. Emulsions may form near the bore.

In the laboratory a weak soln of hydrochloric acid coupled with certain aromatic sulphonic acids greatly increased the effective permeability of bentonitic sands. The hydrochloric acid may produce a hydrogen clay, while the aromatic sulphonic acids may break emulsions. The mixture penetrates filter cakes, and gives any released water a low surface tension. The cake may be dispersed. Large volumes of water are needed to wash these chemicals from sand grains on which they become absorbed.

In the field the minimum vol of treating liq are about 500 gal. Several small batches rather than one large batch seem most effective. The sands studied were rarely thicker than 20 ft. 200 wells were treated, and in some cases producers were obtained from wells which otherwise would have been abandoned. At Opelousas, South Louisiana, four wells which collectively gave 24,450 M. cu. ft. and 704 b.d. of dist, after treatment gave 76,000 M. cu. ft. and 1200 b.d. of dist. At Charenton a well giving

98% water in 25 b.d. net, after squeeze cementing and chemical treatment produced 182 b.d. with no water. The results of other treatments are described. G. D. H.

1875. Improved techniques developed for acidizing gas producing and injection wells. W. H. Justice and J. P. Nielsen. *J. Petrol. Tech.*, Dec. 1952, **4** (12), *AIMME Tech. Paper No.* 3457, 285–8.—At La Gloria it has been necessary to recomplete wells in sands not originally produced, and in these sands impermeability seems to have been developed by fluid penetration in the course of drilling. Acidizing has been used to improve the permeability of this invaded zone.

In one well the hydrostatic head of a column of acid would have exceeded the formation pressure, and so there would have been no back-flow of acid. Therefore acid was injected in 10-brl slugs separated by small volumes of high-pressure gas. This allowed the well to clean itself of acid without being swabbed. This treatment greatly improved the well's output and the tubing pressure.

Injection wells have also been acidized, and the method is described. The acid was displaced by injection gas, and was not back-flowed. G. D. H.

1876. Patent. U.S.P. 2,634,689 (10.8.46; 14.4.53). R. O. Walton. A gas injection valve. D. A. R.

Oilfield Development

1877. Chile—America's most recent oil producer. H. Fraustädter. *Erdöl u. Kohle*, 1953, **6**, 295–6.—Discovered in 1945, production (a state monopoly) started from 2300 c m in 1949 and was 145,000 c m in 1952. Oil (*d* 0·806, S 0·08%) is sent to Uruguay for refining; Valparaiso refinery (3200 cu. m/day) will be operating in 1954. V. B.

1878. Patent. U.S.P. 2,636,924 (1.11.49; 28.4.53). H. T. F. Lundberg and T. Zuschlag, assrs to Lundberg Explorations Ltd. Method of geophysical exploration. D. A. R.

Transport and Storage

1879. Use of piston operated pipeline valves. F. M. Partridge and G. C. Wilson. *Oil Gas J.*, 20.7.53, **52** (11), 125.—Advantages of use of oil-filled piston-operated valves for remote control, or automatic pressure and volume control include accurate valve positioning, reduced maintenance, easy installation, and elimination of complex pressure limiting stations. G. A. C.

1880. New control methods for products pipe lines. Anon. *Oil Gas J.*, 27.7.53, **52** (12), 302.—A new double-piston hydraulic controller is described. Its applications include station pressure control, constant speed pump, and diesel engine control. G. A. C.

1881. New oil pipeline in Ruhr area. H. Bumm. *Erdöl u. Kohle*, 1953, **6**, 392–6.—Conversion of hydrogenation and Fischer–Tropsch plants to crude operation necessitated construction of line from river port at Duisburg-Ruhrort. A 12-km 150-mm line operated by centrifugal pumps leads to Holten, whilst a separate 28-km 200-mm line (700,000 tons/yr) leads to Gelsenkirchen, where two branches (4 and 6 km) supply 2 refineries; on this line owing to varying visc of crude charge gear pumps are employed. Precautions (use of special go-devil, actuating electric valves) are taken to ensure sharp separation of cargoes; interchange contamination has been reduced to 200 litres. Lines are laid 1 m below ground, passage through coal area with consequent liability to subsidence required special measures (expansion joints at average distance of 70 m). Illustrated description, with diagrams, is given of various auxiliaries such as radio-active dewaxing go-devil, meters, tanks, gear pumps. V. B.

1882. Patents. U.S.P. 2,630,236 (14.9.49; 3.3.53). F. G. Arkoosh. Tank construction for liq cargo vehicles.

U.S.P. 2,630,937 (28.8.47; 10.3.53). C. M. Orr and L. C. Bannister, assrs to Chicago Bridge and Iron Co. Seal support for floating roof tanks.

U.S.P. 2,631,558 (31.7.48; 17.3.53). F. R. Harris, assr to Stanolind Oil and Gas Co. Marine oil storage tank.

U.S.P. 2,632,466 (13.1.49; 24.3.53). E. B. Ayers, assr to Standard Oil Development Co. Draw-off means for storage tanks designed to permit complete withdrawal of the contents and minimize frictional generation of static electricity.

U.S.P. 2,632,562 (9.6.48; 24.3.53). C. H. Dragert. Sour crude oils are stored in ferrous tanks, the inner surfaces of which are covered with a coating of finely divided lead metal and an inert binding material. J. M. S.

U.S.P. 2,633,739 (3.3.49; 7.4.53). E. L. Potts and F. L. Scott, assrs to Cicero C. Brown. Apparatus for pressure testing vessels such as pipe and the like.

U.S.P. 2,634,926 (G.B. 18.1.49; 14.4.53). R. F. Worlidge, assr to Flight Refuelling Ltd. Apparatus for installation in aircraft for receiving fuel and liq in flight and control means therefor.

U.S.P. 2,634,927 (G.B. 18.1.49; 14.4.53). C. H. Smith and P. S. Macgregor, assrs to Flight Refuelling Ltd. Apparatus for transferring fuel and other liq from one aircraft to another in flight.

U.S.P. 2,635,626 (13.12.46; 21.4.53). R. E. Meynig. A valve for flow lines.

U.S.P. 2,635,627 (3.6.48; 21.4.53). H. M. McCarthy, assr to Standard Oil Development Co. Auxiliary operated pressure relief valve.

U.S.P. 2,636,202 (27.4.50; 28.4.53). J. E. Hinzman. Pipeline scraper. D. A. R.

Refinery Operations

Refineries and Auxiliary Refinery Plant

1883. Fluidization—unit operation of chemical engineering. J. Cathala. *Combustibles (Zaragoza)*, 1952, **12**, 323–32.—Theoretical analysis of principles of fluidization, quoting experimental results of other workers. Critical current density G_0 of fluidizing medium (*i.e.*, mass velocity at which fluidization commences) is related to porosity (ε_0) of bed, sp.gr. (ρ) and visc (μ) of fluid, sp.gr. (ρ') and particle size (d) of solid, by following relation:

$$G_0 = 0{\cdot}005 \frac{\varepsilon_0{}^3}{1-\varepsilon_0} \cdot (\rho' - \rho)\rho \cdot \frac{d^2}{\varphi^2} \cdot \frac{g}{\mu}$$

where φ is a factor introduced to allow for particle shapes other than spheres. Porosity of static beds is from 0·259 to 0·476 (depending on particle shape) and from 0·5 to 0·9 for fluidized beds. A. C.

1884. Pumoridge pump index. Anon. *Fluid Handl.*, 1953, **36**, 14; **37**, 50; **38**, 82; **39**, 112; **40**, 141. 23 types are discussed. D. H.

1885. The application of electricity to oil refining. S. York. *Fluid Handl.*, May 1953, **39**, 106.—The problems of designing flameproof equipment with respect to pumping, lighting, instrumentation, and abnormality alarms are discussed. The application to condensate de-oiling and to tank gauging, and probable future developments are commented on. D. H.

1886. Noisy compressor engines set mufflers. W. N. Lindblad. *Oil Gas J.*, 20.7.53, **52** (11), 126.—An acoustic filter is described installed on air intakes to reciprocating compressor engines at Hinkley station of Pacific Gas and Electric Co, California. Noise objectionable at 2000 ft was not discernible at this point after installation of filters. A sound reduction chart is given. G. A. C.

1887. First pipeline centrifugal compressor. G. C. Cooper. *Oil Gas J.*, 13.7.53, **52** (10), 131.—A report is given on a 1830-h.p. single-cycle Westinghouse gas turbine centrifugal compressor unit which has been operated by the Mississippi River Fuel and United Gas Corpn.

The unit is practical in this service, and is capable of sustained operation. Under test loading 2000 h.p. was developed, the unit being very flexible, and operating successfully at various rates of flow and compression ratios. Station and installation costs per h.p. are lower than usual. Some changes in the turbine and operation are suggested and performance calculated. G. A. C.

1888. Heat transfer. B. E. Lauer. *Oil Gas J.*, 15.6.53, **52** (6), 153; 20.7.53, **52** (11), 140; 27.7.53, **52** (12), 361.—Pt 34 in this series continues with coeff of heat transfer through film between outside surface of bank of cool tubes and a warm liq, warm tubes and a cool gas, and warm tubes and a cool liq.

Pt 37 of the series deals with coeff of heat transfer through film between outside surface of banks of cool and warm tubes and a condensing vapour, cool gas, and cool liq.

Pt 38 continues with coeff of heat transfer through film between inside and outside surfaces of a cool coil and warm gas and warm liq. G. A. C.

1889. Pump selection. R. L. Jacks. *Oil Gas J.*, 6.7.53, **52** (9), 105; 13.7.53, **52** (10), 143; 20.7.53, **52** (11), 135; 27.7.53, **52** (12), 359.—A chart is given in 6 July issue of the Engineering Reference Section showing capacities of reciprocating pumps, with pump size and max recommended piston speed.

In the next issue of the Engineering Reference Section a chart is given of mechanical efficiencies of reciprocating pumps, whereby the pressure rise in the fluid cyl can be calculated.

The following part specifies the process pump and gives a chart showing process specification for pumping equipment.

The Engineering Reference Section then deals with the method of determining the number of pumps required for a job. Quality of fluid to be handled is important in order to determine construction materials. G. A. C.

1890. Patents. U.S.P. 2,635,990 (2.5.49; 21.4.53). R. R. Goins, assr to Phillips Petroleum Co. Pebble heat-exchanger.

U.S.P. 2,635,864 (28.12.48; 21.4.53). R. R. Goins, assr to Phillips Petroleum Co. Pebble heating and reaction chamber. D. A. R.

Distillation

1891. Patents. U.S.P. 2,630,305 (29.4.49; 3.3.53). R. C. Scofield and J. Krahe, assrs to Pan American Refining Corpn. Tower packing with layers of wire fabric in capillary contact.

U.S.P. 2,630,406 (2.10.50; 3.3.53). C. B. Linn, assrs to Universal Oil Products Co. Ethylbenzene is separated from a mixture with xylenes by adding liq boron trichloride and fractionally dist.

U.S.P. 2,631,970 (24.9.49; 17.3.53). D. K. Barnes, assr to Stanolind Oil and Gas Co. Alcohols are purified by adding an α-hydroxylamine compound and dist. Oxidizable contaminants are thereby removed. J. M. S.

U.S.P. 2,633,717 (29.9.49; 7.4.53). W. W. Paget, assr to Joy Manufacturing Co. In a rectification column, an open-ended walled chamber having openings in the walls thereof, means to provide a fluid-tight seal between the column and the chamber at the open end of the chamber, a plurality of conduits open at both ends to the chamber exterior and having their ends secured in the openings, a pair of spaced-apart condensate collector troughs beneath the conduits, and a liq distributor mounted adjacent the troughs and having a connexion to receive liq from one of them.

U.S.P. 2,635,992 (1.3.49; 21.4.53). C. S. Carlson and P. V. Smith, assrs to Standard Oil Development Co. Separation and purification of alcohols by extractive dist.

U.S.P. 2,636,842 (19.2.51; 28.4.53). R. D. Barr, assr to Standard Oil Development Co. A method for dist a treated hydrocarbon fraction which comprises admixing at least a substantially sweetened fraction boiling in the gasoline and kerosine boiling range and containing disulphides susceptible to thermal decomposition with a treating reagent comprising a hydrocarbon fraction boiling in the lub oil boiling range, an alkali metal sulphonate, and an alkali metal hydroxide, subjecting the admixture to dist conditions and recovering from the dist an overhead fraction substantially free of mercaptans and disulphides. D. A. R.

Solvent Extraction and Dewaxing

1892. Catalytic cycle-stock heating unit. C. F. Tears. *Oil Gas J.*, 15.6.53, **52** (6), 119.—A typical study is given of furfural treating of cycle stock for a cat cracking unit to increase virgin capacity of the unit with significant increase in percentage yield of cat gasoline. Typical application, yields, and cost comparisons are given. G. A. C.

1893. Patents. U.S.P. 2,630,376 (15.11.49; 3.3.53). R. W. Dunn, assr to Regents of the University of California. Multiple extraction apparatus.

U.S.P. 2,631,966 (8.5.50; 17.3.53). A. W. Francis, assr to Socony-Vacuum Oil Co. Hydrocarbons from the gas oil to lub oil ranges are separated into fractions by extraction with liq CO_2 and a solvent which is at least partially miscible with the hydrocarbons and liq CO_2, removing CO_2 from the extract phase and allowing to settle to form an extract-raffinate and an extract-extract, separating these phases and removing solvent from the extract-raffinate to leave a hydrocarbon fraction of higher V.I. than the original mixture.

U.S.P. 2,632,030 (19.5.50; 17.3.53). A. W. Francis, assr to Socony-Vacuum Oil Co. Similar to U.S.P. 2,631,966.

U.S.P. 2,632,765 (27.2.47; 24.3.53). H. G. McGrath, assr to M. W. Kellogg Co. Separation of Fischer–Tropsch products by extracting the oil product phase with aq alcohol.

U.S.P. 2,633,448 (12.9.50; 31.3.53). M. B. Neuworth, assr to Pittsburgh Consolidation Coal Co. Aromatic and saturated hydrocarbons are separated by solvent extraction with a paraffinic naphtha and aq methanol. J. M. S.

Cracking

1894. Patents. U.S.P. 2,630,352 (29.1.47; 3.3.53). W. J. Degnen and W. B. Johnson, assr to M. W. Kellogg Co. Means for controlling the flow of powdered solids between two contacting zones.

U.S.P. 2,630,404 (17.8.49; 3.3.53). C. V. Berger, assr to Universal Oil Products Co. A mixture of straight-run gasoline and an olefinic hydrocarbon is contacted with a Pt–alumina cat at a pressure >100 p.s.i. and at 750° to 1000° F.

U.S.P. 2,630,616 (8.10.48; 10.3.53). S. P. Robinson, assr to Phillips Petroleum Co. Stabilized alumina contact material in the form of pebbles is made by compacting $\frac{1}{8}$-inch to 1-inch spheres from active alumina and 0·1 to 10% wt phosphoric acid, slowly drying the spheres and calcining them at 2800° to 3200° F for $\lt 2$ hr.

U.S.P. 2,630,617 (28.12.48; 10.3.53). S. P. Robinson, assr to Phillips Petroleum Co. Alumina pebbles are made by forming a plastic mix of alumina, a volatile plasticizer and 0·5 and 2·0% wt of an alkaline earth metal fluoride, compacting the mixture into balls and calcining at 2800° to 3250° F for $\lt 2$ hr.

U.S.P. 2,631,089–90 (16.8.50; 10.3.53). J. S. Palmer, assr to Standard Oil Development Co. Apparatus for conducting conversion operations in which a dense phase of fluidized solids is maintained below a disperse phase of such solids.

U.S.P. 2,631,123 (9.4.49; 10.3.53). A. F. Kanlakis, assr to Standard Oil Development Co. Cracking cat is hydrated between the regeneration and conversion zones by injecting steam into a vertical column of the fluidized cat at a number of different levels.

U.S.P. 2,631,124 (18.6.46; 10.3.53). H. J. Ogorzaly, assr to Standard Oil Development Co. In fluid cat cracking processes using a silica–alumina, silica–magnesia, or activated clay cat, the slurry of cat fines and hydrocarbon bottoms, left as a residue in the fractionation of the products, is passed in a tortuous path through an electromagnetic zone to remove iron contaminants from the slurry, and the decontaminated slurry is returned to the reaction zone. J. M. S.

U.S.P. 2,634,232 (23.9.49; 7.4.53). E. J. Houdry. A process for cracking hydrocarbons in a fixed cat bed.

U.S.P. 2,635,987 (7.4.50; 21.4.53). L. Berg, assr to Phillips Petroleum Co. A process for producing a gasoline fraction from shale oil.

U.S.P. 2,635,988 (11.2.49; 21.4.53). J. A. Crowley, assr to Socony-Vacuum Oil Co. Hydrocarbon conversion process.

U.S.P. 2,635,989 (31.8.50; 21.4.53). Z. D. Bonner, assr to Gulf Oil Corpn. A process of hydrocracking a hydrocarbon by contacting liq.–vapour mixture of a hydrocarbon with hydrogen and a cat.

U.S.P. 2,636,844 (29.8.50; 28.4.53). C. N. Kimberlin, C. E. Adams, R. W. Krebs, and R. W. Richardson, assrs to Standard Oil Development Co. A process for cracking heavy residual oils to form gasoline and lower boiling hydrocarbons.

U.S.P. 2,634,241 (29.12.50; 7.4.53). G. M. Webb, assr to Standard Oil Co. A process for purifying a manganese-contaminated silica–alumina gel cat.

U.S.P. 2,635,071 (30.4.49; 14.4.53). E. H. Atwood and E. D. Keiper, assrs to Socony-Vacuum Oil Co. Fixed-bed cat draw-off method and apparatus.

U.S.P. 2,635,080 (17.3.50; 14.4.53). H. R. Appell, assr to Universal Oil Products Co. A method of reactivating a spent cat containing platinum supported on alumina which comprises treating the cat with an aq soln of aluminium nitrate and aluminium chloride and dissolving a substantial portion, at least, of the platinum in the soln without dissolving the alumina to a substantial extent, and subsequently re-impregnating the alumina with platinum.

U.S.P. 2,635,081 (13.12.50; 14.4.53). I. W. Mills and H. L. Johnson, assrs to Sun Oil Co. An improved hydrogenation cat consisting essentially of a spent cracking cat containing deposited thereon 10 to 25% molybdenum disulphide, the spent cracking cat comprising a cracking cat previously utilized as the cat in a process for cracking hydrocarbons until its cracking activity was spent to an extent of at least 30% of its initial cracking activity.

U.S.P. 2,635,082 (28.1.52; 14.4.53). R. L. Smith, assr to Socony-Vacuum Oil Co. Process for activating chromia–alumina cat.

U.S.P. 2,635,110 (26.11.46; 14.4.53). C. W. Watson, assr to Texas Co. Regeneration of hydrocarbon synthesis cat. D. A. R.

Alkylation

1895. Patents. U.S.P. 2,630,460 (31.1.50; 3.3.53). V. N. Ipatieff and H. Pines, assrs to Universal Oil Products Co. Benzene is cat *cyclo*alkylated with a monocyclic dihydroterpene or dihydroterpenic alcohol to form 1-methyl-1-phenyl-4-*iso*propyl-*cyclo*hexane, which is dehydrogenated to form 4-*iso*propylbiphenyl, methane, and hydrogen.

U.S.P. 2,631,172 (29.1.48; 10.3.53). L. Schmerling, assr to Universal Oil Products Co. A benzene hydrocarbon and 1 : 3-dichloro-3-methylbutane are reacted at −20° to 50° C in presence of aluminium chloride dissolved in a nitrohydrocarbon. J. M. S.

Isomerization

1896. The isomerization of butane. R. Lipovscak. *Nafta (Yugoslavia)*, April 1953, **4**, 115–19.—The general chemistry of butane isomerization and the main features of the present day commercial processes for butane isomerization are briefly reviewed. (Author's Abstract.)

1897. Patents. U.S.P. 2,632,739 (12.10.49; 24.3.53). J. A. Dinwiddie and C. J. G. Leesemann, assrs to Standard Oil Development Co. Supported cat for producing aromatic hydrocarbons, consisting of a molybdate of a metal of the left-hand column of group II of the periodic table, containing 0·1 to 10% wt of potassium oxide or hydroxide or an inorganic salt of potassium.

U.S.P. 2,632,779 (29.5.50; 24.3.53). R. F. Pfennig, assr to Standard Oil Development Co. A feed stock consisting of C_8 aromatic hydrocarbons from which *p*-xylene has been removed by chilling, is contacted with a cat consisting of an oxide or sulphide of a group VI metal at 800° to 1150° F in the presence of hydrogen and under a pressure of 50 to 500 p.s.i. and *p*-xylene is recovered from the product by crystallization.

J. M. S.

Chemical and Physical Refining

1898. Thermofor continuous percolation. L. P. Evans, K. E. Magin, J. I. Savoca, and H. W. Shea. *Oil Gas J.*, 8.6.53, **52** (5), 116.—Laboratory scale studies in the development programme for the process for decolorizing lub oils, process and mechanical design of commercial units, and the economics of the continuous process are given. It is stated that the process has a substantially lower investment cost than conventional static-bed percolation, and has a distinct advantage over hot contacting because of lower operating costs. G. A. C.

1899. Hydrodesulphurization. H. Hoog, H. G. Klinkert, and A. Schaafsma. *Oil Gas J.*, 8.6.53, **52** (5), 92.—The development is described of a trickle hydrodesulphurization process for the production of low-sulphur middle distillates from high-sulphur stocks, such as straight-run and cat cracked distillates and shale oils.

Process shows savings in initial investment of 15 to 20%, and reduced operating costs over other processes, with 85 to 90% sulphur removal.

Tables show effect of H_2S in recycle gas, product properties from Middle East light cat cracked cycle oil, and cost of hydrodesulphurization. G. A. C.

1900. Patents. U.S.P. 2,634,230 (29.11.49; 7.4.53). R. C. Arnold and J. F. Deters, assrs to Standard Oil Co. Desulphurization of olefinic naphtha.

U.S.P. 2,634,231 (16.4.51; 7.4.53). W. W. Johnstone, assr to Universal Oil Products Co. A method of refining a sour hydrocarbon dist.

U.S.P. 2,634,298 (31.12.49; 7.4.53). C. M. Himel and L. O. Edmonds, assrs to Phillips Petroleum Co. A fractional crystallization process for separating *meso*-erythritol from *di*-erythritol.

U.S.P. 2,634,299 (12.7.49; 7.4.53). C. M. Himel and L. O. Edmonds, assrs to Phillips Petroleum Co. Recovery of erythritols.

U.S.P. 2,635,072 (30.12.50; 14.4.53). T. Q. Eliot, assr to Stanolind Oil and Gas Co. Method for purification of amyl alcohols.

U.S.P. 2,635,074 (24.4.49; 14.4.53). A. Steitz, assr to Stanolind Oil and Gas Co. A method for the purification of alcohols produced by the reduction of carbon monoxide with hydrogen.

U.S.P. 2,635,111 (17.3.49; 14.4.53). H. G. McGrath, H. J. Passino, and L. C. Rubin, assrs to M. W. Kellogg Co. A process for recovering organic acids and alcohols in a liq phase obtained from the treatment of the reaction product produced in the cat hydrogenation of oxides of carbon.

U.S.P. 2,635,123 (28.11.50; 14.4.53). R. M. Kennedy, assr to Sun Oil Co. Process for reforming a gasoline fraction boiling in the range of from 60° to 400° F and containing at least 5% naphthenes.

U.S.P. 2,636,050 (3.5.51; 21.4.53). R. I. Hoaglin and W. M. Frankenberger, assrs to Union Carbide and Carbon Corpn. A process for separating methanol and methyl acetate from mixtures thereof.

U.S.P. 2,636,054 (25.8.47; 21.4.53). H. F. Johnson, assr to Standard Oil Development Co. Process for recovery of *cyclo*pentadiene.

U.S.P. 2,636,055 (18.10.50; 21.4.53). T. G. Jones, assr to Standard Oil Development Co. Di*cyclo*pentadiene recovery process.

U.S.P. 2,636,056 (18.10.50; 21.4.53). T. G. Jones, assr to Standard Oil Development Co. Process of recovery of *cyclo*pentadiene and methyl *cyclo*pentadiene from cracked petroleum.

U.S.P. 2,636,841 (10.11.50; 28.4.53). R. B. Mason, assr to Standard Oil Development Co. A process of desulphurizing and upgrading sulphur-containing high-boiling petroleum fractions.

U.S.P. 2,636,843 (4.10.50; 28.4.53). R. C. Arnold and J. F. Deters, assrs to Standard Oil Co. A method of desulphurizing a cracked naphtha, boiling chiefly in the range of *ca* 150° to 400° F and containing at least *ca* 2% sulphur.

U.S.P. 2,636,911 (25.7.50; 28.4.53). G. C. Ray, assr to Phillips Petroleum Co. The removal of acetylene from a stream of hydrocarbons containing acetylene and ethylene.

U.S.P. 2,636,912 (29.7.49; 28.4.53). G. T. Leatherman, assr to Phillips Petroleum Co. An improvement in a process of reducing the content of organic fluorine present as an impurity in a hydrocarbon material by subjecting the hydrocarbon material to dist in contact with a solid dehydrofluorination cat. D. A. R.

Special Processes

1901. Carbon monoxide conversion on alkalized activated charcoal. Pt. I. P. Royen and F. Ehrard. *Erdöl u. Kohle*, 1953, **6**, 195–9.—Investigation of the formate intermediate product responsible for CO_2 formation during reduction of CO. Specially purified charcoal used as cat was impregnated with K_2CO_3, and rate of formation and decomp of HCOOK studied. Probable reaction mechanism is suggested: $K_2CO_3 + 2\,CO + H_2O = 2\,HCOOK + CO_2$; decomp is by hydrolysis, dehydrogenation of the formic acid and neutralization of KOH formed, overall equation being $2\,HCOOK + H_2O = K_2CO_3 + CO_2 + 2\,H_2$. V. B.

1902. Globe solves pressing air-pollution problem with new-type sulphur-recovery unit. J. G. Ulcek and R. A. Graff. *Oil Gas J.*, 6.7.53, **52** (9), 64.—The installation is described at Lemont, Illinois, belonging to Globe Oil and Refining Co. The unit recovers 13 tons of sulphur per day from 20,000 cu. ft/hr of acid gas, only 3 process vessels being required for the 2-stage conversion of H_2S to elemental sulphur. G. A. C.

1903. Patents. U.S.P. 2,633,873 (11.10.47; 7.4.53). D. E. Stines, assr to Standard Oil Development Co. Elastic surface liner for apparatus handling finely divided abrasive solids.

U.S.P. 2,634,191 (3.1.51; 7.4.53). B. G. Jones, assr to Tide Water Associated Oil Co. Initial sealing of cyclone dip-legs.

U.S.P. 2,634,194 (31.10.51; 7.4.53). H. J. Nebeck, assr to Universal Oil Products Co. A lined reactor for effecting contact between a reactant stream and subdivided solid contact material.

U.S.P. 2,634,197 (9.10.49; 7.4.53). R. T. Cellier. A method of pyrolysis of hydrocarbons to produce oil gas.

U.S.P. 2,633,622 (8.10.48; 7.4.53). S. P. Robinson, assr to Phillips Petroleum Co. A process for manufacturing stabilized alumina contact material in the form of pebbles

highly resistant to attrition and breakage under cyclic thermal and mechanical shock conditions.

U.S.P. 2,633,623 (11.7.49; 7.4.53). S. P. Robinson, assr to Phillips Petroleum Co. A process for manufacturing pebbles for moving-bed heat-transfer purposes.

U.S.P. 2,636,049 (G.B. 18.2.49; 21.4.53). J. W. C. Crawford, assr to I.C.I. Ltd. Normal and *iso*propyl methacrylate production.

U.S.P. 2,636,011 (2.2.48; 21.4.53). A. Clark, assr to Phillips Petroleum Co. Improving a reduced iron oxide cat, for the synthesis of hydrocarbons from carbon, monoxide and hydrogen, promoted with a minor proportion of potassium oxide.

U.S.P. 2,635,952 (5.7.46; 21.4.53). E. L. d'Ouville, assr to Standard Oil Co Manufacture of hydrogen-carbon monoxide mixture.

U.S.P. 2,635,950 (26.4.48; 21.4.53). S. P. Robinson, assr to Phillips Petroleum Co. A process for manufacturing heat- and shock-resistant alumina pebbles.

U.S.P. 2,635,947 (2.7.48; 21.4.53). H. C. Reed and C. H. O. Berg, assrs to Union Oil Co. A process which comprises coking a hydrocarbon oil in the presence of fluidized particles of a higher oxide of iron.

U.S.P. 2,635,949 (24.3.49; 21.4.53). M. R. Fenske and T. M. Reed, assrs to Standard Oil Development Co. Apparatus for contacting solids with fluids.

U.S.P. 2,636,057 (23.8.49; 21.4.53). H. W. Cutcher and C. A. Ray, assrs to Phillips Petroleum Co. An improvement in a process for dehydrating an aliphatic alcohol to preferentially produce a 1-olefin.

U.S.P. 2,636,051 (5.4.48; 21.4.53). R. R. Whetstone and S. A. Ballard, assrs to Shell Development Co. A process for the production of amines by condensation of a saturated aliphatic dialdehyde with ammonia, or an amine, and hydrogen.

U.S.P. 2,636,047 (3.10.49; 21.4.53). G. Riethof and G. P. Brown, assrs to Gulf Research and Development Co. A process comprising intimately contacting a heavy hydrocarbon mixture with a pentavalent vanadium compound at an elevated temp of at least 100° C under substantially non-oxidizing conditions, separating the vanadium compound from the resulting treated hydrocarbon oil, and oxidizing the treated hydrocarbon oil by passing a stream of an oxygen-containing gas through the oil at an elevated oxidn temp.

U.S.P. 2,636,805 (31.12.48; 28.4.53). R. C. Lassiat and R. M. Shirk, assrs to Houdry Process Corpn. Disengagement of gases from fluent solid particles.

U.S.P. 2,636,845 (8.9.49; 28.4.53). R. W. Richardson, J. P. Bilisoly, and M. A. Segura, assrs to Standard Oil Development Co. A method of reactivating partially deactivated silica–alumina hydrocarbon conversion cat containing *ca* 12% of alumina which has been used in a number of conversion operations and regeneration operations.

U.S.P. 2,636,847 (12.6.51; 28.4.53). G. P. Hammer and T. G. Jones, assrs to Standard Oil Development Co. Purification of OXO alcohols by controlled water treatment.

U.S.P. 2,636,853 (28.12.49; 28.4.53). J. L. Franklin, Jr., assr to Standard Oil Development Co. A method for alkylating a paraffin having at least 3 and no more than 5 carbon atoms with a mono-olefin having at least 3 and no more than 5 carbon atoms per mol.

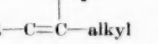
U.S.P. 2,636,854 (29.12.49; 28.4.53). H. E. Cier, assr to Standard Oil Development Co. Photochemical production of naphthenic hydrocarbons.

U.S.P. 2,636,865 (19.11.48; 28.4.53). C. N. Kimberlin, assr to Standard Oil Development Co. A process for producing alumina-containing products.

U.S.P. 2,636,883 (31.1.45; 28.4.53). A. C. Byrns, assr to Union Oil Co of California. The process which comprises reacting thiophene, methyl thiophene, or thiophene-containing petroleum dist fractions with acetic anhydride in the presence of a zinc chloride cat, between *ca* 0·13 and 0·17 mol of said cat being employed per mol of acetic anhydride.

U.S.P. 2,636,899 (29.1.51; 28.4.53). L. A. Burrows, R. M. Cavanaugh, and W. M. Nagle, assrs to E. I. du Pont de Nemours and Co. Manufacture of terephthalic acid in a one-step operation.

U.S.P. 2,636,901 (11.5.49; 28.4.53). J. B. Tindall, assr to Commercial Solvents Corpn. An improvement in a process for the reduction of nitro-olefins of the type



where R is alkyl, phenyl, alkyl substituted phenyl or alkoxyphenyl, to produce a mixture of amines and ketones containing a predominant proportion of amines.

U.S.P. 2,636,902 (G.B. 7.1.49; 28.4.53). A. W. C. Taylor, P. Davies, and P. W. Reynolds, assrs to I.C.I. Ltd. A process for the production of amines.

U.S.P. 2,636,903 (20.10.49; 28.4.53). J. K. Mertzweiller, assr to Standard Oil Development Co. Synthesis of oxygenated organic compounds.

U.S.P. 2,636,904 (28.2.50; 28.4.53). C. E. Starr and E. M. Charlet, assrs to Standard Oil Development Co. An improvement in a carbonylation reaction process in which olefins, hydrogen, and carbon monoxide are reacted to provide aldehydes in the presence of a cobalt cat and in which a cobalt carbonyl decomposing zone is provided, and in which a soaking tank is employed.

U.S.P. 2,636,905 (23.5.50; 28.4.53). H. J. Kehe and J. E. Jansen, assrs to B. F. Goodrich Co. A composition of matter useful as an antioxidant, composed of a mixture of aralkylated bis-phenolic compounds resulting from the reaction of an aryl-substituted alkene hydrocarbon with an alkylidene bis-phenol in the presence of an acidic condensation cat at a temp of from 100° to 250° C, the mixture having at room temp a semi-solid to resinous consistency and being free of compounds which boil below 200° C at a pressure of 0·75 millimetre of mercury.

U.S.P. 2,636,906 (5.3.48; 28.4.53). H. S. Davis, assr to American Cyanamid Co. Ethylene oxide is passed into an aq hydrochloric acid until a neutral soln of ethylene chlorohydrin and ethylene glycol is formed.

U.S.P. 2,636,909 (26.12.51; 28.4.53). A. G. Oblad and G. A. Mills, assrs to Houndry Process Corpn. The method of converting C_7 naphthenes in a naphtha charge to toluene with the simultaneous production of at least some benzene or xylenes.

D. A. R.

Metering and Control

1904. Measuring instruments and controllers in the petroleum industry. F. Rüb. *Erdöl u. Kohle*, 1953, **6**, 396–400.—General consideration of principles of instrumental control, followed by brief descriptions of typical instruments. Diagrams are given showing operation of electrical current-balance for flow measurement, pneumatic level-controller, electro-pneumatic temp controller, and electro-pneumatic control of acid treatment of oil coupled with flow-control, which is independent of the visc or pressure of the liq. V. B.

1905. Measuring fluid flow by sound waves. Anon. *Oil Gas J.*, 15.6.53, **52** (6), 149.—A new type of electronic flow meter is described. This was developed by the National Bureau of Standards, and utilizes change in velocity of sound waves as a measure of fluid flow. G. A. C.

1906. Patents. U.S.P. 2,630,819 (9.6.48; 10.3.53). A. S. Norcross. Apparatus for controlling the visc of a processing liq.

U.S.P. 2,631,931 (27.12.49; 17.3.53). D. W. Shaeffer and F. A. Cowell, assrs to Phillips Petroleum Co. Apparatus for control of pressure in a gas main.

U.S.P. 2,633,472 (6.10.47; 31.3.53). W. F. Eberz, assr to Petrolite Corpn. Colorimetric method of controlling the amount of a reagent mixed with a liq.

U.S.P. 2,633,480 (20.6.49; 31.3.53). W. S. Staff, assr to Socony-Vacuum Oil Co. Pencil galvanometer. J. M. S.

PRODUCTS

Chemistry and Physics

1907. Sulphur compounds in petroleum. S. F. Birch. *J. Inst. Petrol.*, 1953, **39**, 185–202.—Data have been obtained on the physical properties of some dialkyl and monocyclic sulphides which was previously not available. The presence of thiophenes in an Iranian naphtha has been established, but the bulk of the sulphur compounds extracted by mercurous acetate were found to be mono- and bi-cyclic sulphides. The methods of identification of these compounds are described.

The problem of the form in which sulphur is present in crude oils before dist is discussed with reference to the methods of formation of sulphur compounds which have been found in dist. A. R. W. B.

1908. The preparation and properties of di-alkyl di- and poly-sulphides. Some disproportionation reactions. S. F. Birch, T. V. Cullum, and R. A. Dean. *J. Inst. Petrol.*, 1953, **39**, 206–19.—The preparation of some unsymmetrical dialkyl disulphides and symmetrical dialkyl polysulphides is described and their physical properties are listed.

It has been found that on exposure to light the disulphides polymerize with acrylonitrile indicating the formation of free radicals by the disulphides. Previous difficulty in preparing methyl ethyl disulphide in a pure state has been found due to a photochemical disproportionation reaction. Data are presented on the disproportionation reactions of other disulphides. A. R. W. B.

1909. The isomeric thiophthens and their ethyl homologues. The orientation of derivatives of liquid thiophthen. F. Challenger and B. Fishwick. *J. Inst. Petrol.*, 1953, **39**, 220–36.—An extensive study of substitution in solid thiophthen and in liq thiophthen has been carried out. It is known that electrophilic substituents, including the $-COCH_3$ group, enter the same position in the solid and the liq isomer. The methyl ketones of the two thiophthens have been reduced to the corresponding ethylthiophthens, which have been characterized by the preparation of numerous derivatives. It has been shown thereby that electrophilic substituents enter the liq thiophthen molecule in the 2- or α-position, where the sulphur atom occupies position 1. A. R. W. B.

1910. Information on chemical fibres. E. Elöd. *BrennstChemie*, 1953, **34** (5–6), 66–71.—Chem fibres are reviewed and classified in 3 groups which give some indication of their properties. Chain formation of sp fibres is shown by structural formulæ, in which the reciprocal reaction between adjacent mol is indicated. A refined microtechnique permits a deeper insight into the fine structure of the chem fibres. This new technique is illustrated by transverse photographs of sp extruded threads after swelling. Structural contrasts are enhanced by oblique illumination. R. T.

1911. Patents. U.S.P. 2,631,136 (8.7.49; 10.3.53). V. Haensel, assr to Universal Oil Products Co. Cat prepared by mixing aq solns of a platinum compound, a hydrogen halide, and ammonium hydroxide.

U.S.P. 2,631,759 (8.11.47; 17.3.53). J. E. Hoopes, assr to Sinclair Refining Co. Slide valve for controlling the flow of suspended solids.

U.S.P. 2,631,921 (10.8.46; 17.5.53). W. W. Odell, assr to Standard Oil Development Co. Fluids and fluidized solids are contacted in the presence of larger-sized stationary solids.

U.S.P. 2,631,927 (28.2.50; 17.3.53). R. P. Trainer and L. E. Border, assrs to Shell Development Co. Regenerator for stripping and removing carbonaceous deposits from spent fluidized cat.

U.S.P. 2,631,928 (14.5.47; 17.3.53). R. E. Howe and W. S. Gullette, assrs to Sinclair Refining Co. Fluidized cat cracking reactor.

U.S.P. 2,631,967 (19.12.49; 17.3.53). H. A. Dutcher and C. E. Alleman, assrs to Phillips Petroleum Co. Conversion of hydrocarbons using solid particulate cat and pebble heating.

U.S.P. 2,631,968 (25.6.45; 17.3.53). M. E. Perry, assr to Shell Development Co. Silica–alumina cracking cat is maintained in a state of high activity by dispersing a portion of the used cat in a liq having a density between that of the most dense and that of the least dense of the particles, separating the floating particles and returning them to use together with fresh cat.

U.S.P. 2,631,981 (10.7.48; 17.3.53). K. M. Watson, R. E. Howe, and R. L. Smith, assrs to Sinclair Refining Co. Rejection of inactive material from a fluidized cat regenerator, by means of an elutriating medium introduced into a settling zone in short frequency pulsations.

U.S.P. 2,631,983 (29.12.48; 17.3.53). T. H. Milliken, assr to Houdry Process Corpn. Preparation of siliceous cat beads containing free magnesia.

U.S.P. 2,632,692 (18.1.49; 24.3.53). A. D. Korin and J. Robell, assrs to Hydrocarbon Research Inc. Multiple bed cat apparatus.

U.S.P. 2,632,727 (3.8.50; 24.3.53). K. P. Lanneau and E. M. Charlet, assrs to Standard Oil Development Co. Gas oils containing aromatic constituents are contacted with silica gel to remove the aromatics and then cat cracked.

U.S.P. 2,633,449 (28.12.49; 31.3.53). L. K. Cheney, assr to Sinclair Refining Co. In a thermal cracking process employing a tar separator between the cracking and fractionation zones, the tar bottoms from the separator are heated at 850° to 950° F for a time sufficient to limit cracking to 10% wt, and then treated with steam in a pitching tower at 790° to 880° F. Gas oil recovered from the pitching tower is recycled to the main cracking process.

U.S.P. 2,633,454 (29.12.48; 31.3.53). W. A. Rex and K. J. Nelson, assrs to Standard Oil Development Co. Apparatus for the production of microspherical inorganic gel particles. J. M. S.

Analysis and Testing

1912. Stress relaxation in compression of rubber and synthetic rubber vulcanizates immersed in oil. J. R. Beatty and A. E. Juve. *India Rubb. World*, 1953, **127** (3), 357–62, 423.—Stress relaxation in compression in air has been studied for compounds of various polymers. However, rubber seals, gaskets, and other applications are widely used where swelling agents such as oil are encountered. It was thought desirable to measure the stress relaxation properties of various rubbers to determine their performance under such conditions. The results show that continuous stress relaxation is inhibited by the presence of oil, and that unconfined swelling measurements predict the degree of inhibition directly. The variables of temp and oil type were studied. C. N. T.

1913. The construction of a liquid dielectrics test cell. S. Baxter and H. A. Vodden. *J. sci. Instrum.*, 1952, **29** (11), 379–80.—A simple method is described for constructing a concentric cyl cell of high performance, using readily available equipment. For measurements of the electrical properties of a liq, the condenser is immersed in the liq contained in a suitable vessel, the size of which fixes the vol of liq required. The capacitance of the empty cell described is about 80 p.f., but this value can be altered by using inner cyl of different dia. Provided that the quartz supports are clean, the p.f. of the empty cell should be negligible ($<0{\cdot}00001$) for audio-frequencies at room temp, whilst the inherent resistance is greater than $10^{6}\Omega$. The cell can readily be dismantled and reassembled, this facilitating cleaning after using sticky liq, such as silicones, and also viscous liq can be studied without the formation of obstinate air bubbles between the electrodes. C. N. T.

1914. An apparatus for measuring the coefficient of thermal conductivity of solids and liquids. T. A. Marshall. *J. appl. Phys.*, 1953, **4**, 112–14.—A flat plate type of apparatus for measuring the coeff of thermal conductivity of solids and liq is described.

Values which have been obtained for the coeff of several typical cable dielectric materials (*e.g.*, oil-impregnated paper) over their working temp range are given.
C. N. T.

1915. Acid treatment of shale gasoline. Pt II. Some treatment reactions. G. E. Mapstone, J. S. Durham, W. J. Hogan, B. Nartsissov, G. Nottes, and J. Szewczyk. *J. Inst. Petrol.*, 1953, **39**, 153–81.—In treating with sulphuric acid, it has been found that, as the temp increases, the desulphurization efficiency and treatment loss increase even with mild acid treats. Analysis of the spent neutralization caustic wash suggests that the surface active acids formed are produced to the extent of 2% of the olefins present in the gasoline, and are principally alkyl sulphuric acids. In an attempt to remove thiophenes selectively the aminomethylation was tried but found only partly successful. A. R. W. B.

1916. Chromatography and its applications. J. L. M. Cordon. *Combustibles* (*Zaragoza*), 1952, **12**, 243–53, 333–51.—Brief account of history and nature of chromatography, together with comparison of theories of fractional dist and adsorption. Applications quoted include use in analysis of products from hydrogenation of coal, quant separation of aromatics from non-aromatics, production of carotene, chlorophyll, plutonium, and pure hydrocarbons. Description of radial chromatography. 131 refs.
A. C.

1917. Applications of infra-red spectroscopy. A. M. Tinao. *Combustibles* (*Zaragoza*), 1952, **12**, 259–70, 409–16; 1953, **13**, 12–26.—Account of apparatus and techniques involved in determining infra-red spectra, with applications to qual and quant analysis. Details of identification of various compounds and functional groups by characteristic absorption frequencies, and methods of estimating composition of gaseous, liq, and solid samples. 152 refs. A. C.

1918. Use of infra-red spectrophotometry in laboratory practice. E. G. Hoffmann. *BrennstChemie*, 1953, **34** (5–6), 71–5.—The infra-red spectrometer, which works automatically after adjustment to required recording conditions, is discussed. Absorption spectra are obtained in 20 minutes to 1 hr. The instrument is applied to qual and quant analysis of hydrocarbons and their mixtures, and determination of constitution and purity. The text is supported by numerous relevant spectra. R. T.

1919. Reaction decomposition of lead-petrol. O. Widmaier. *BrennstChemie*, 1953, **34** (5–6), 83–7.—The theory of combustion at the temp and pressure prevailing in the motor is discussed. Experiments carried out in an autoclave using a 10% soln of ethylfluid–petrol have shown that lead bromide, lead oxide, lead triethylbromide, and oxidized hydrocarbons result from the decomp. Ethylfluid decomp depends on temp. At 100° C and pressures of 20 to 60 kg/cm^3 lead oxide is formed, at higher temp and various pressures lead triethylbromide formation is favoured. Experiments show that lead triethylbromide—an intermediate product in the motor—formed at temp up to 100° C and pressures *ca* 60 kg/cm^2) has an antiknock effect. Tabulations and charts are presented. 15 refs. R. T.

1920. The new standard method for the measurement of the viscosity of oils and other liquids in C.G.S. units. Anon. *J. Inst. Petrol.*, 1953, **39**, 237–9.—The absolute visc of water at 20·00° C has recently been measured by the Nat. Bur. of Standards, and the new value of 0·01002 poise is to be used from 1 July 1953. Water is to be used as the sole calibrating liq for viscometers. After 1 July 1953 all values of kin. visc obtained by the old method must be multiplied by 0·997. A. R. W. B.

1921. Application of paper partition chromatography to petroleum analysis. E. Mariani. *J. Inst. Petrol.*, 1953, **39**, 240–1.—This technique has been used to determine whether pure asphaltenes still contained any oil and resins by carrying out the chromatography in benzene soln. A. R. W. B.

1922. Patents. U.S.P. 2,633,016 (29.8.47; 31.3.53). J. W. Millington, assr to Sun Oil Co. Apparatus for measuring visc. J. M. S.

U.S.P. 2,633,737 (25.5.45; 7.4.53). P. D. Richardson, assr to Cambridge Instrument Co. Gas analyser for plural mixtures. D. A. R.

Crude Oil

1923. Physico-chemical study of the crude oils of the Pechelbronn concession. J.-P. Hilfiger. *Rev. Inst. franç. Pétrole*, Nov. 1952, **7** (11), 407–24.—During the period 1949–51 a study based on 690 analyses (sulphur content, paraffin, asphalt, refractive index, distillation, etc., in each case) yielded no conclusive results on the geographical and geological distribution of the oils. Late in 1950 the use of the correlation index was begun. Because the mode of collection and subsequent handling of a sample of crude may change some features, a fraction dist between 250° and 275° C at atm pressure has been considered, and its density and refractive index measured. However, it has been found that there may be marked variations of the properties with time even in single wells, and these variations were not unidirectional. The determination of the paraffins, naphthenes, and aromatics by chromatography appeared promising.

In using the correlation index the oils were first dehydrated electrically. By Hempel–Bureau of Mines dist 10 25° C fractions were taken from 50° to 275° C. 5 25° C fractions were separated at 40 mm of mercury. The sp. gr. of these were measured, and then the Bureau of Mines tables gave the correlation index, and a correlation index curve was drawn. In applying the results the form of the curve was considered more important than a variation of 2 to 3 points in values for a fraction. The value is an indication of the dominant hydrocarbon groups in the fraction.

Curves and tables show that while the correlation index curve has the same form at different dates, other specific properties are variable.

The Hempel dist results are of interest also in refining, for they give data on yields.

The sources of 30 crudes are listed, and certain analytical results are given for these crudes. The correlation index curves are considered to show broadly 2 families, one corresponding to a paraffinic crude, and one to a more altered crude. The Upper Pechelbronn is excluded because it occurs about 60 m deep and is much altered.

It could be supposed that the mixed type oil is an altered form of the paraffin type, and samples have been heated with various cat at temp up to 190° C and pressures up to 5 atm to investigate this possibility. The main changes were in the lower fractions.

G. D. H.

Gas

1924. Estimating natural gas composition from absorption index and specific gravity. T. W. Legatski, J. W. Tooke, and L. A. Grundy. *Oil Gas J.*, 27.7.53, **52** (12), 292.—A chart has been developed to predict hydrocarbon composition of natural gas when the specific gravity and absorption index of the gas are known. 12 graphs show comparison of graphical *vs* fractional analysis of ethane, propane, etc., and a table gives effect of small concn of nitrogen on graphical analysis. G. A. C.

1925. Absorption index. T. W. Legatski, J. W. Tooke, and L. A. Grundy. *Oil Gas J.*, 27.7.53, **52** (12), 266.—The new absorption index test predicts the butane and heavier content of a natural gas with a precision of $\pm 5\%$ based on fractional analysis. The test measures equilibrium pressure developed when 40 vol of gas sample are mixed with 1 vol of pure normal octane at 760 mm pressure and 100° F. Sketches of apparatus and graphs are given. G. A. C.

Engine Fuels

1926. How combustion-chamber deposits affect engine-fuel requirements. J. J. Mikita, W. E. Bettoney, and M. J. Fowle. *Oil Gas J.*, 6.7.53, **52** (9), 84.—Combustion-chamber deposits increase octane number requirement of an engine because they speed up reactions which lead to knock or ignite the air–fuel mixture, this leading to uncontrolled combustion. Thermal insulation, surface ignition, catalysis, fuel lubricant changes, and pre-ignition evidence are discussed. G. A. C.

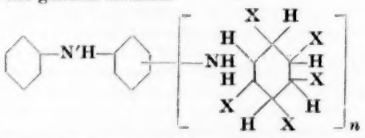
1927. A viscosimeter for use with boiler oil. Anon. *Mot. Ship*, June 1953, **34** (399), 122.—The viscometer described was developed by M.A.N.; it is designed specially for use at sea, and can be fitted in any part of the fuel admission piping. It can also be used for the control of the visc of bunker oil for boiler furnaces and for lub oils and other liq. U. M.

1928. Heavy fuel oil for auxiliary engines. Anon. *Mot. Ship*, June 1953, **34** (399), 113.—This is a short article giving notes on a paper, read by J. Smith at a meeting of the North East Coast Institution of Engineers and Shipbuilders, "The Use of Heavy Fuels in Diesel Engines." A series of engine tests were described, conducted to determine the conditions necessary for satisfactory performance of auxiliary engines on heavy fuel. Fuels of different visc and cyl liners, pistons, and valves of different materials were used in the tests. U. M.

1929. Patents. U.S.P. 2,630,405 (30.4.48; 3.3.53). L. C. Fetterly, assr to Shell Development Co. Engine fuel consisting of 5 to 15% substantially normal hydrocarbons having a boiling range within the limits 275° to 425° F, and 85 to 95% substantially non-normal hydrocarbons having a boiling range within the limits 415° to 660° F.

U.S.P. 2,633,415 (21.2.49; 31.3.53). J. A. Chenicek, assr to Universal Oil Products Co. Gasoline containing a quaternary ammonium alkoxide and *p*-aminophenol or *p*-phenylene-diamine. J. M. S.

U.S.P. 2,635,042 (7.4.50; 14.4.53). E. F. Hill, assr to Ethyl Corpn. A new composition consisting essentially of a petroleum hydrocarbon motor fuel for I.C. engines normally tending to deteriorate in the presence of oxygen and a (*cyclo*-hexylamino) diphenylamine having the general formula



wherein X is selected from the group consisting of hydrogen and alkyl, *n* is an integer from 1 to 2 inclusive, and the number of alkyl substituents on each *cyclo*hexyl radical varies from 1 to 2 inclusive. D. A. R.

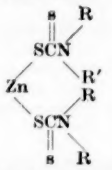
Lubricants

1930. Patents. U.S.P. 2,635,078 (27.11.50; 14.4.53). F. H. Stross and S. T. Abrams, assrs to Shell Development Co. A lubricating grease composition comprising 55 to 98% by wt of a mineral lub oil and 2 to 45% by wt of a colloidally dispersed metallic sulphide.

U.S.P. 2,636,001 (22.12.50; 21.4.53). G. V. Browning and G. M. Webb, assrs to Standard Oil Co. Grease preparation.

U.S.P. 2,636,005 (24.2.51; 21.4.53). J. S. Martin, assr to Hamilton Watch Co. A watch lubricant consisting of the ester of diethylene glycol mono ethyl ether and 9- and 10-*m*-xylyl stearic acid.

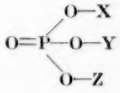
U.S.P. 2,636,858 (7.6.51; 28.4.53). R. H. Jones and L. E. Moody, assrs to Standard Oil Development Co. A mineral oil containing *ca* 0·1 to *ca* 20% by wt of an additive consisting of (*a*) a product obtained by reacting a phosphorus sulphide with a hydrocarbon and neutralizing the acidic reaction product thus formed with a nitrogen base and (*b*) a zinc dithiocarbamate of the formula



in which R and R′ are hydrogen or hydrocarbon radicals, at least one being a member of the group consisting of aliphatic and *cyclo*aliphatic hydrocarbon radicals, the total number of carbon atoms in the two groups being at least 6, the ratios of the two ingredients of the additive being from 5 to 20 pts by wt of (*a*) to 1 pt by wt of (*b*).

U.S.P. 2,636,859 (29.1.51; 28.4.53). G. Entwistle and H. J. Voss, assrs to Sinclair Refining Co. A grease composition consisting essentially of a mineral oil and soap compounded grease and *ca* 0·05 to *ca* 2 wt % of an oil soluble higher alkylated diphenylamine and *ca* 0·02 to 2 wt % of a dimethylaminomethyl alkylphenol.

U.S.P. 2,636,861 (9.6.50; 28.4.53). F. J. Watson, assr to Shell Development Co. A composition of matter comprising 50 to 90% by wt of a trialkyl phosphate, each alkyl radical of which contains 4 to 9 carbon atoms; 5 to 25% by wt of a triaryl phosphate having the general formula:



where X is the phenyl radical, Y is an alkyl substituted phenyl radical wherein each alkyl group therein contains not more than 5 carbon atoms and Z is a phenyl or an alkyl substituted phenyl radical wherein each alkyl group therein contains not more than 5 carbon atoms: 2 to 20% by wt of a linear polymer of methacrylic acid esters having a mol. wt. within the range 5,000 to 25,000; 0·5 to 3·0% by wt of a glycidyl hydrocarbyl ether or a hydrocarbon epoxide and 0·05 to 0·5% by wt of a hydrocarbyl sulphide.

U.S.P. 2,636,862 (4.6.50; 28.4.53). F. J. Watson, assr to Shell Development Co. A hydraulic fluid composition comprising a major proportion of a dialkylarylphosphine oxide, 0·25 to 5% by wt of the total composition of an epoxy compound and 0·025 to 1% by wt of the total composition of an aliphatic disulphide, an aromatic disulphide, a sulphurized sperm oil, or a sulphurized terpene. D. A. R.

Bitumen, Asphalt, and Tar

1931. Extensive agreement exists on grain structure of black surfacings. British and Swedish standards. E. Neumann. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (4), 89–94.—British, American, Swedish, and German road surfacings show great similarity in grain structure as indicated by close agreement of their sieve summation curves. The bitumen portion also adjusts itself regularly to the grain structure. Brief information on 95 systematically varied surfaces, each *ca* 50 m long, tested at Ekerö, Sweden, indicates greater reliability of conventional asphalt concrete. R. T.

1932. Setting behaviour of thin films of cut-back bitumen of different composition. A. Scheurer. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (4), 99–103.—Vaporization loss, scratch resistance, and adhesive power of cut-back bitumens are determined on thin films on glass slides prepared as described, with the apparatus used for coal tars (*cf Abstr.* 2473, **1952**). The study includes standard dist of the bitumens. The dist residue has a soft. pt. lower than the original bitumen, still lower than films stored 8 days, and *ca* the consistency of the binder remaining in road surfacings. Loss in wt of the films after 24 hr indicates quantity and volatility of the cutting-back oil. Visc is decisive for the height of the initial adhesive power, scratch resistance, and the earlier occurrence of adhesive power max, whose occurrence is accelerated by a more readily and completely volatile oil. For soft bitumens the adhesive power remains higher, the scratch resistance and its increase lower, for a longer time. Initial scratch resistance proceeds parallel with original visc, vals are observed after 2 days, by surface adhesive power measurements after 5 days. Binding effect on the mineral grains is related to the change from oily-liq to plastic condition, characterized by the val of the soft. pt., or better of the dropping pt, thus the binder may not be liq at ordinary temp, but the dropping pt may occur first at 30° C, *i.e.*, at soft. pt. K–S 15° to 16°. The minimum soft. pt. occurs with sample No. 3 (87% B 200), after 8 days, at 17·5 C, with relative scratch resistance 42 g. The required plasticity therefore, for cut-back bitumen is reached at *ca* 40 g. Results >40 g do not characterize the true setting behaviour in road surfacings and are of little practical val. They indicate only changes undergone by the binder, effected by air and light, in the thinnest surface stratum. R. T.

1933. Joint-sealing compounds. H. Kölzow. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (4), 103–6.—Review of progress in joint sealing, which originated with the use of natural asphalt by the Assyrians for stone slab military roads. Sealing of stone paving, concrete roads, and tramways, with operating technique, are discussed. Sealing masses are obtainable which fulfil all requirements if used as directed. R. T.

1934. Patents. U.S.P. 2,632,712 (2.4.51; 24.3.53). N. E. Lemmon and R. E. Karll, assrs to Standard Oil Co. Bitumen containing 0·1 to 2% of a polymerized fat acid containing at least one double bond.

U.S.P. 2,632,979 (G.B. 4.8.48; 31.3.53). T. F. N. Alexander. Method of growing grass, comprising preparing a seed bed, covering the bed with a granular mass and covering the granular mass with a layer of bitumen. J. M. S.

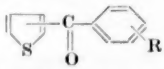
U.S.P. 2,635,966 (20.3.50; 21.4.53). V. C. Irvine and H. J. Sommer, assrs to Shell Development Co. An asphalt composition comprising a major amount of asphalt and a minor amount, sufficient to increase the adhesivity of the asphalt, of an amide of a high mol. wt. non-aromatic carboxylic acid. D. A. R.

Special Hydrocarbon Products

1935. Better-than-nitration-grade benzene. Anon. *Oil Gas J.*, 13.7.53, **52** (10), 105.—A report is given of the operation of the gasoline-upgrading plant of the Atlas Processing Co., Shreveport.

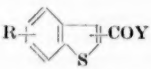
Research-grade benzene is recovered from naphtha obtained from natural gas in the Carthage, Texas, field. The gas is free from sulphur and olefins, and the 3 to 4% benzene is recovered in a phenol extractive-dist unit; 15,000 b.d. being processed to yield about 21,500 g.p.d. of nitration-grade material. Benzene recovery is between 97 and 99%. Tables show characteristics of the product material balance, laboratory tests yield, and stock characteristics. G. A. C.

1936. Patents. U.S.P. 2,634,200 (26.12.51; 7.4.53). A. H. Schlesinger, assr to Monsanto Chemical Co. The method of destroying undesirable plants which comprises applying to the plants a toxic quantity of a herbicidal composition comprising a ketone having the formula



in which R is hydrogen or an alkyl radical of from 1 to 5 carbon atoms.

U.S.P. 2,634,201 (26.12.51; 7.4.53). D. T. Mowry and A. H. Schlesinger, assrs to Monsanto Chemical Co. The method of destroying undesirable plants which comprises applying to the plants a toxic quantity of a herbicidal composition comprising a ketone having the formula



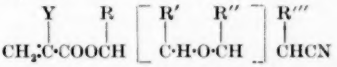
in which R is hydrogen or an alkyl radical of from 1 to 5 carbon atoms, and Y is an alkyl radical having from 1 to 5 carbon atoms.

U.S.P. 2,634,202 (25.4.50; 7.4.53). J. K. Fincke, assr to Monsanto Chemical Co. A method for destroying undesired plants which comprises applying to the plants a lethal quantity of a herbicidal composition comprising a sulphone having the general formula

in which R is an alkyl radical of from 1 to 12 carbon atoms or the vinyl radical.

U.S.P. 2,634,203 (17.12.51; 7.4.53). D. T. Mowry and A. H. Schlesinger, assrs to Mousanto Chemical Co. The method of destroying undesirable plants which comprises

applying to the plants a toxic quantity of a herbicidal composition comprising an oil-in-water emulsion of a cyano ether ester having the formula



in which Y, R, R′, R″, and R‴ are hydrogen or the methyl radical and n is an integer of from 1 to 3.

U.S.P. 2,634,226 (3.6.49; 7.4.53). G. M. Kosolapoff, assr to Monsanto Chemical Co. An unsymmetrical diethyl dioctyl pyrophosphate.

U.S.P. 2,634,227 (3.6.49; 7.4.53). G. M. Kosolapoff, assr to Monsanto Chemical Co. Unsymmetrical diethyl diphenyl pyrophosphate.

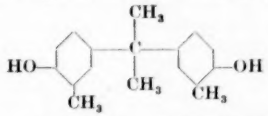
U.S.P. 2,634,234 (16.7.49; 7.4.53). N. H. Kuhrt, assr to Eastman Kodak Co. Production of monoesters of polyhydric alcohols.

U.S.P. 2,635,054 (30.6.48; 14.4.53). P. C. Doyle and K. H. Rudd, assrs to Standard Oil Co. Mastic tile containing a filler, a binder, a vegetable oil pitch, and wax tailings.

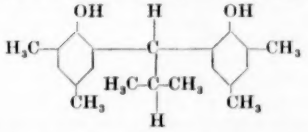
U.S.P. 2,635,055 (8.7.48; 14.4.53). H. G. Figdor. An aq emulsion of the oil-in-water type suitable for waterproofing textiles and the like.

U.S.P. 2,635,986 (10.2.49; 21.4.53). H. V. Hess, G. B. Arnold, W. E. Skelton, and W. V. Overbaugh, assrs to Texas Co. Continuous process for separation of wax-like constituents from oil.

U.S.P. 2,636,002 (7.6.50; 21.4.53). R. G. Capell, W. P. Ridenour, and J. A. Stewart, assrs to Gulf Research and Development Co. An improved wax composition comprising a major amount of a paraffin wax and a minor amount, sufficient to inhibit oxidative deterioration, of a compound having the following structural formula:



U.S.P. 2,636,003 (7.6.50; 21.4.53). R. G. Capell, W. P. Ridenour, and J. A. Stewart, assrs to Gulf Research and Development Co. An improved wax composition comprising a major amount of a paraffin wax and a minor amount, sufficient to inhibit oxidative deterioration, of a compound having the following structural formula:



U.S.P. 2,636,004 (7.6.50; 21.4.53). R. G. Capell, W. P. Ridenour, and J. A. Stewart, assrs to Gulf Research and Development Co. An improved wax composition comprising a major amount of a paraffin wax and a minor amount, sufficient to inhibit oxidative deterioration, of a phenylethyl catechol.

U.S.P. 2,635,977 (21.8.48; 21.4.53). R. E. Lidov, assr to Shell Development Co. A compound having the structure:

wherein X is of the group consisting of (1) hydrogen, and the compound has a melting point of *ca* 100·5° to 104·5° C and (2) carbethoxy, and the compound has a melting point of *ca* 119° C.

U.S.P. 2,635,979 (31.12.47; 21.4.53). R. E. Lidov, assr to Shell Development Co. A compound selected from the group consisting of (1) 1 : 4 : 5 : 8 : 9 : 10-trimethano-1 : 2 : 3 : 4 : 13 : 13-hexachloro-1 : 4 : 4a : 5 : 6 : 7 : 8a : 9 : 9a : 10 : 10a-dodeca-hydroanthracene melting at from about 173° to about 175° C, (2) 1 : 2 : 3 : 4 : 10 : 10-hexachloro-1 : 4 : 4a : 5 : 6 : 7 : 8 : 8a-octahydro-1 : 4 : 5 : 8-dimethano-naphthalene melting at from about 77° to about 78° C., (3) 6-chloro, (4) 6 : 6-dichloro, (5) 6-acetoxy, (6) 6-hydroxy, (7) 6-phenyl, (8) 6-keto, (9) 6 : 7-dimethyl, (10) 6 : 6 : 7-trimethyl, and (11) 6-ethyl-7-methyl derivatives of the dimethano-naphthalene as an insecticide.

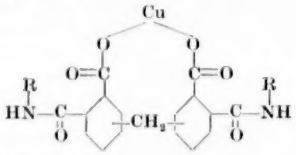
U.S.P. 2,636,815 (27.5.49; 28.4.53). N. M. Molnar and E. Segessemann. A composition of matter suitable for killing water-weeds comprising a homogeneous mixture of *ca* 65 parts of coal tar naphtha having specific gravity of 0·86, *cc* 35 parts of hexachlorethane, and *ca* 5 parts of an emulsifying agent, the finished product having a specific gravity greater than 1.

U.S.P. 2,636,816 (13.12.47; 28.4.53). W. D. Stewart, assr to B. F. Goodrich Co. Altering the growth characteristics of plants with a composition of an inert diluent as a carrier and, as the essential active ingredient, *ca* 0·001 to 5% by wt of a compound having the formula

$$X—CH_2CH_2COOH$$

where X is a halogen atom, and derivatives thereof capable of being converted to the free acid through hydrolysis involving 1 mol of water.

U.S.P. 2,636,839 (17.10.49; 28.4.53). H. G. Smith, M. L. Hill, and T. L. Cantrell, assrs to Gulf Oil Corpn. An insecticidal composition comprising at least one insecticide toxicant, a solvent therefor, and a condensation product of formaldehyde and a substantially neutral calcium salt of an N-alkyl phthalamidic acid, the condensation product having the following formula:



wherein R is a C_8–C_{20} alkyl group. D. A. R.

Derived Chemical Products

1937. Further extracts from Paley Commission Report on Coal and Petroleum Chemicals and Products. Pt IV. G. Egloff. *India Rubb. World*, 1953, **127** (4), 511–13, 566.—5 tables show the requirements, during the period 1955–75, for chemical conversion of all basic materials that can be derived from petroleum or natural gas by recovery or refining processes. Topics discussed include estimates of basic materials derived from natural gas and from cracking processes (olefins), and also of aromatics and other chemical source materials, such as detergents, sulphur, cresylic acids, and naphthenic acids. The assumptions made in the various calculations are outlined. It is shown that up to 1975, the chemical requirements can be met through the allocation of small percentages of petroleum and natural gas to that purpose. C. N. T.

1938. Patents. U.S.P. 2,634,238 (1.2.50; 7.4.53). E. C. Soule, assr to Mathieson Chemical Corpn. A dry, stable detergent composition consisting essentially of about about 0·5 to 8 pts by wt of calcium hypochlorite containing upwards of about 50% available chlorine, about 3 to 20 pts by wt of finely divided substantially anhydrous potassium carbonate, about 5 to 20 pts by wt of a sodium polyphosphate, and about 5 to 20 pts by wt of a synthetic water sol organic detergent which is a sulphate, sulphonate, or a quaternary ammonium salt which does not produce an insoluble ppt in the presence of calcium ions.

U.S.P. 2,634,240 (9.7.49; 7.4.53). J. C. Showalter and A. J. Shmidl, assrs to Standard Oil Development Co. A composition adapted for use as a detergent which consists of from 10 to 60 wt % of alkali metal salts of xylene sulphonic acids, from 4 to

35 wt % of alkali metal salts of alkyl aryl sulphonic acids having from 9 to 16 carbon atoms in the alkyl side chain, and from 30 to 60 wt % of a water sol inorganic alkali metal salt.

U.S.P. 2,634,248 (14.9.49; 7.4.53). J. Dazzi, assr to Monsanto Chemical Co. A plasticized vinyl chloride resin.

U.S.P. 2,634,250 (5.3.51; 7.4.53). L. Y. Kiley, assr to United States Rubber Co. A composition of matter comprising a mixture of a thermosetting, sol, fusible phenol-aldehyde resin of the novolac type, a rubbery copolymer of butadiene-1 : 3 and an unsubstituted monovinylpyridine or an alkyl-substituted monovinylpyridine.

U.S.P. 2,634,254 (6.11.50; 7.4.53). R. D. Lipscomb, assr to E.I. du Pont de Nemours and Co. A 3-component solid polymer consisting of from 0·01 to 10 mol % of sulphur dioxide, from 0·90 to 39 mol % of carbon monoxide and from 99 to 51 mol % of a polymerizable aliphatic mono-olefinic hydrocarbon containing a terminal methylene group and from 2 to 4 carbon atoms.

U.S.P. 2,634,256 (15.2.49; 7.4.53). W. J. Sparks, D. W. Young, and J. D. Garber, assrs to Standard Oil Development Co. A composition of matter comprising a solid, somewhat brittle, non-elastomeric resin composed of at least 50% of copolymerized butadiene with not more than 50% of copolymerized D.I.B. and having an iodine number within the range between 60 and 250, a mol. wt. within the range between 500 and 20,000, together with maleic anhydride combined with the residual double bonds of the copolymerized resin.

U.S.P. 2,634,257 (11.9.51; 7.4.53). W. F. Faragher, assr to Houdry Process Corpn. A process for the production of a high mol. wt. elastic hydrocarbon copolymer consisting of butadiene and styrene.

U.S.P. 2,634,258 (14.7.50; 7.4.53). W. D. Stewart, assr to B. F. Goodrich Co. Polymerizing a monomeric material comprising a butadiene-1 : 3 hydrocarbon in aq emulsion at a pH of 9·5 to 11·5 and a temp from $-30°$ to $+30°$ C in the presence of a cat consisting of 0·01 to *ca* 2·0% of ferrous gluconate reducing agent and 0·10 to 2·0% of an organic peroxide oxidizing agent, the reducing agent and oxidizing agent being in a ratio of from 1 reducing agent : 2 oxidizing agent to *ca* 6 reducing agent : 1 oxidizing agent, said percentages being based on the wt of the monomeric material.

U.S.P. 2,634,260 (18.11.51; 7.4.53). J. E. Carnahan, assr to E.I. du Pont de Nemours and Co. An improvement in a process for the polymerization of an ethylenically unsaturated polymerizable organic compound containing an ethylenic double bond as the sole aliphatic carbon-to-carbon unsaturation and which is capable of undergoing addition polymerization across an ethylenic double bond in the presence of a peroxy catalyst.

U.S.P. 2,634,261 (19.1.48; 7.4.53). L. C. Fetterly, assr to Shell Development Co. As a new composition of matter, a crystalline complex of urea with primary alkylamine, a secondary dialkylamine, a mononitroalkene, or a mononitroalkane.

U.S.P. 2,634,281 (9.8.49; 7.4.53). G. P. Mack and E. Parker, assrs to Advance Solvents and Chemical Corpn. An organo-tin sulphonamide useful as a stabilizer for vinyl halide resins, of the formula $R_m—Sn(R'NO_2SR'')_n$ wherein the tin atom is directly connected to the nitrogen atom of the sulphonamide group and R represents an alkyl radical having 1 to 12 carbon atoms, R′ hydrogen, alkyl, or aryl, R″ is alkyl, aryl, or aralkyl, and wherein $m + n$ is 4, m being an integer from 2 to 3.

U.S.P. 2,634,286 (17.11.49; 7.4.53). M. A. Elliott, E. L. Clark, and H. H. Storch, assrs to U.S.A. (Secretary of the Interior). Production of hydrocarbon synthesis gas from coal.

U.S.P. 2,634,287 (1.4.48; 7.4.53). J. K. Fincke, assr to Monsanto Chemical Co. In a process of sulphation wherein a stream of liq SO_3 containing dissolved SO_3 is mixed with a stream of liq SO_2 containing a dissolved aliphatic hydroxy compound, whereby the hydroxy compound is sulphated and heat of sulphation is liberated, the step of flowing the mixed streams through a nozzle and completely evaporating the liq SO_2 within the nozzle solely by means of the heat of sulphation, whereby the SO_3 becomes combined with the hydroxy compound at a temp of at least 20° C.

D. A. R.

Coal, Shale, and Peat

1939. Synthetic liquid fuel in the U.S.A. Anon. *Petrol. Times*, 24.7.53, **57** (1460), 730.—Pt I, Oil from Coal, and Pt II, Oil from Oil Shale of the Annual Report for 1952 of the U.S. Bureau of Mines Report of Investigations, are commented upon, with reference to coal hydrogenation, the Fischer–Tropsch process, production of synthetic gas oil from oil shale, and a new method of retorting. G. A. C.

1940. Patent. U.S.P. 2,634,233 (16.6.49; 7.4.53). L. A. Nicolai and B. V. Molstedt, assrs to Standard Oil Development Co. A process of dist oil-bearing minerals of the type of oil shale which disintegrate during dist. D. A. R.

Miscellaneous Products

1941. Compounded detergents. D. Price. *Soap, N.Y.*, March 1953, **29** (3), 54.—A generalized account of industrial cleaners is given. M. V. J.

1942. Detergents effect on skin. — *Soap, N.Y.*, Feb. 1953, **29** (2), 93.—A digest of an article by W. Schneider in *Soap, Perfumery, and Cosmetics*, Jan. 1953, is presented. The action of soap and synthetic detergents on the skin and the development of non-irritant cleaners and barrier materials are discussed. M. V. J.

1943. Production of sulphonates. Anon. *Soap, N.Y.*, Feb. 1953, **29** (2), 91.—A summary of an article by H. Stuepel in *Soap, Perfumery, and Cosmetics*, Dec. 1952, is presented. 3 theories of mechanism of sulphonation are briefly stated. Tables show: relation of amount and concn of acid required to temp of reaction; effect of standing period on unsulphonated material and colour; calorific data; and yield and composition of neutralized paste. M. V. J.

1944. Nonionics—the all surface cleaners. Pt I. M. N. Fineman. *Soap, N.Y.*, Feb. 1953, **29** (2), 46.—A simple detergency test using an oily carbon paste as soil, and involving agitation of clean and soiled substrates in detergent under examination, is described. The test enables efficiency in cleaning and in preventing soil redeposition to be determined. Some observations are made on the efficiency of the test and illustrated by graphs.

The test, using metal and glass substrates, revealed differences between ionic and nonionic detergents. Anionics cleaned glass efficiently, but metal only poorly, whereas the cationics were poor with glass. Nonionics were shown to clean both substrates effectively and to be good soil suspending agents. M. V. J.

1945. Nonionics—the all-surface cleaners. Pt II. M. N. Fineman. *Soap, N.Y.*, March 1953, **29** (3), 50.—The phenomenon of wetting is considered in relation to the varying efficiency of detergents with different substrates. Results of tests on various detergents using different substrates (metals, alloys, ceramic tile, linoleum, and plastic) are given. Nonionics, both built and unbuilt, were superior to an anionic detergent (an alkyl aryl sulphonate) and to an alkaline salt (sodium tripolyphosphate). With silver and linoleum only the nonionics were effective, and with melmac only one of the nonionics. Mixtures of anionics and alkaline salt were on the whole better than either used separately. Blends of nonionics and alkaline salt gave excellent results, and a graph is included showing efficiency of blend related to cost. 4 refs. M. V. J.

1946. Anionic detergents. A. T. Lewandowski. *Soap, N.Y.*, April 1953, **29** (4), 49.—A method of determining low concentrations of anionic detergents in soln is described. The method depends on the colour reactions produced when a soln of anionic detergent is added to a mixture of a cationic detergent and acidified bromphenol blue. The method was found to be applicable to several common anionic synthetic detergents, but not to soap. The colour reactions are independent of pH, hardness of water, and inorganic and organic materials frequently found in cleaner formulations. M. V. J.

1947. Soap use in dairies. H. G. Harding. *Soap, N.Y.*, April 1953, **29** (4), 52.—Amount of soap used compared with other cleaning materials is small. Chief uses are for conveyor lubrication and hand-washing where a non-phenolic germicidal soap is desirable. M. V. J.

1948. D.C.M.X.—new chlorophenol. J. Gemmell. *Soap, N.Y.*, March 1953, **29** (3), 95.—After a brief historical survey of phenol disinfectants the author presents data on D.C.M.X. (2 : 4-dichloro-3 : 5-dimethyl phenol). Solubility in most organic solvents is high; light stability is poor, but can be improved by the addition of terpinolene; bactericidal and fungicidal properties are excellent; toxicity is low, and skin irritation effects have not been reported. Among the applications mentioned are: in disinfectant and antiseptic fluids (chief use), leather treatment and preservation of glue, starch, dextrin and casein products. D.C.M.X. compares very favourably with hexachlorophene in germicidal soaps, and has higher activity against gram negative organisms. 23 refs. M. V. J.

1949. A method for determining water in insecticidal aerosols. R. A. Fulton and R. P. Gelardo. *Soap, N.Y.*, Feb. 1953, **29** (2), 145.—Water is extracted from the aerosol container with ethylene glycol and then titrated with Karl Fischer reagent. Details of procedure and apparatus are given. The method removes 95% water when present in the 15 to 150-p.p.m. range: at higher concn 2 extractions are necessary to maintain the same accuracy. 4 refs. M. V. J.

1950. Mildew control—possibilities of *p*-dichlorobenzene as an aid in preventing damage by mildew. R. S. Shumard. *Soap, N.Y.*, March 1953, **29** (3), 150.—*p*-Dichlorobenzene has long been used for moth control, and now laboratory tests are described, indicating that it is an effective fungistatic agent. Dosage depends on a number of factors—in a moderate climate, a closet of about 100 cu. ft. capacity with a relatively loose door was afforded complete protection for 2 years using 1 lb of *p*-dichlorobenzene for the 3 summer months and 1 lb during the entire winter. It is necessary to ensure that the atmosphere is kept saturated as *p*-dichlorobenzene is fungistatic, but not fungicidal. It is safe to use with most items to be protected, but may harm newer synthetic fibres. M. V. J.

1951. Powder type bleaches. M. A. Lesser. *Soap, N.Y.*, April 1953, **29** (4), 154.—A review of sodium perborate as a bleach for use in the home and commercial laundries is given. Sodium perborate can be used on silk, cotton, wool, and most synthetic fibres and does not fade colours. In Europe the perborate is frequently incorporated in washing powders. Typical formulæ for such products are given. 27 refs. M. V. J.

1952. Modern metal polishes. M. A. Lesser. *Soap, N.Y.*, March 1953, **29** (3), 157.—The functions and formulation of metal polishes are reviewed. 26 refs. M. V. J.

1953. Some problems of paint specification testing. R. M. C. Logan. *J. Oil Col. Chem. Ass.*, July 1953, **36** (397), 373.—It was decided that work should be carried out at the author's laboratory on the preparation of their own buying specifications, and as a long-term policy it was attempted to find out where skill and experience of the operator were necessary in paint specification testing and to modify the testing clause to eliminate one or other, or both, of these factors. The work is still in progress and the present paper is an interim report. Individual tests are evaluated. These include: tests for consistency, coarseness, odour, opacity, covering power and spreading power, skinning, drying time, film thickness, bend tests, accelerated weathering, and accelerated ageing. D. K.

1954. Paint removers. M. A. Lesser. *Soap, N.Y.*, Feb. 1953, **29** (2), 133.—A survey of the paint remover field is presented. Alkalis and solvents remain chief active ingredients with other compounds, such as wetting agents, evaporation retarders, and thickeners to enhance their efficiency. Formulæ are quoted. 37 refs. M. V. J.

1955. Radio-chemistry in paint research. D. F. Rushman. *J. Oil Col. Chem. Ass.*, July 1953, **36** (397), 352.—The basic principles and techniques of radio-chemistry are outlined. A survey is made of the applications and methods of interest to the paint industry, the applications being illustrated by reference to work carried out at the Paint Research Station. These applications include the examination of paint–substrate interfaces, leaching during weathering, determination of potassium in

certain pigments, the analysis of complex mixtures by isotopic dilution, and the location and partial identification of fatty acids in a chromatogram. Examples are given of the use of a labelled cat for following the course of dehydration of castor oil and the use of ^{14}C in following ester interchange reactions. 8 refs. D. K.

1956. Plasticizers for elastomers. M. A. Pollack. *India Rubb. World*, 1953, **127** (4), 497–502, 510.—The petroleum products used directly are mainly unsaturated and cyclized fractions from cracking and isomerization processes and residues. The necessary qualities are availability and permanence, which includes volatility, compatibility, and ageing resistance. The desirable qualities are low cost, good colour, odour, and taste, non-toxicity, mildew resistance, non-inflammability, non-migration, thermal stability, efficiency, electrical properties, etc.

The importance of low-temp performance of plasticizers is stressed; this is strongly influenced by three characteristics of the plasticizer, namely compatibility, visc, and V.I. A study of the relation between freezing points of the plasticizer and the plasticized elastomer showed that there was no direct primary relation between the two, and, in many cases, the occurrence of association complexes and eutectic mixtures must be considered. This principle may possibly be used to advantage in the production of extreme low-temp compounds by the use of properly selected blends of plasticizers.
C. N. T.

Corrosion

1957. Bacterial corrosion of offshore structures. J. A. Caldwell and M. L. Lytle. *Corrosion*, 1953, **9** (6), 192–6.—Experiments in the laboratory and in the field have indicated that steel in offshore structures may be corroded by sulphate-reducing bacteria. The corrosion due to bacterial action is slight, and is completely suppressed by cathodic protection. K. G. B.

1958. Hydrogen attack on steel in refinery equipment. W. A. Bonner, H. D. Burnham, J. J. Conradi, and T. Skei. *Oil Gas J.*, 8.6.53, **52** (5), 100.—The experience is given of the Shell Oil Co at their Wood River refinery on the problem of hydrogen attack on steel. It was found that sulphur added as ammonium polysulphide to the light hydrocarbon stream was effective in preventing hydrogen attack. The elimination of water and of poisoning agents, and effect of cleaner steel are among other factors.
G. A. C.

1959. Corrosion control. Anon. *Oil Gas J.*, 15.6.53, **52** (6), 151.—This part deals with stray-current corrosion, and a figure shows an electrified street railway system typical of d.c. systems.

Locating stray currents is accomplished by making a potential survey of the earth in vicinity of the pipeline. G. A. C.

1960. Corrosion control. M. E. Parker. *Oil Gas J.*, 6.7.53, **52** (9), 113.—This issue deals with anode-bed inspection and maintenance, and describes how to locate inactive anodes. G. A. C.

1961. Cathodic protection applied to tank bottoms. S. P. Ewing and J. S. Hutchinson. *Corrosion*, 1953, **9** (7), 221–31.—It is difficult to ascertain that the protective current at the centre of a cathodically-protected tank bottom is sufficient for complete protection. A tentative method is given of determining the efficiency of current distribution beneath a tank from soil resistivity measurements in the neighbourhood of the tank. An empirical relation giving this efficiency has been derived, using electrically-scaled models. Attempts to confirm the method in practice were encouraging, but not completely successful. K. G. B.

1962. Examination of 335 miles of asphalt mastic coated pipe. D. E. Miltner. *Corrosion*, 1953, **9** (7), 210–15.—The whole line, laid in 1941, was surveyed by an electrical method for coating discontinuities. The rate of discontinuities was only one per 4 miles. Cathodic protection had not adversely affected the sound coating, although it had caused additional damage at pin-holes. There was little evidence of soil stress.
K. G. B.

1963. Locating high-resistance joints in underground piping. M. E. Parker. *Oil Gas J.*, 20.7.53, **52** (11), 141.—Basic principle of location is imposition of a voltage along line and investigation of potential drop to find points of discontinuity. Variations of method give 4 different techniques which are described. G. A. C.

1964. Amine stress corrosion. G. L. Garwood. *Oil Gas J.*, 27.7.53, **52** (12), 334.—Phillips Petroleum Co have found that, to prevent stress corrosion cracking in water-amine gas-treating equipment, new equipment should be stress-relieved, and so should old equipment after welding. Other steps include lowering of kettle temp from 290° to 240° F, blanketing amine surge tanks with sweet gas from absorbers to exclude oxygen, and use of reclaimers to remove heavy mol. wt. material and acids from soln. G. A. C.

1965. Graphitization in refining equipment. R. J. Fioretino and A. M. Hall. *Oil Gas J.*, 8.6.53, **52** (5), 110.—Results of research on graphitization by API Committee are given. No instances of failure in refinery equipment due to graphitization have been found. Only about 6% of plate-steel samples showed graphitization sufficient to cause specimens to crack in cold-bend test. Continuous " eyebrow " type of graphite formation not observed, and none of the carbon-molybdenum steels showed any evidence of graphitization. G. A. C.

1966. How to estimate corrosivity of crude oils. H. A. Cataldi, R. J. Askeyold, and A. E. Harnsberger. *Oil Gas J.*, 20.7.53, **52** (11), 100.—2 methods are described which compare performances of a known crude against that of an unknown oil. The Standard Oil Co procedure is based on electrical resistance of a steel specimen after exposure to a definite volume of crude oil under specified conditions. The Pure Oil Co's method depends on volume of H_2S released under definite conditions. Tables show corrosion test data and evaluation summary of results on both methods. G. A. C.

1967. Patents. U.S.P. 2,634,223 (1.7.49; 7.4.53). E. H. Clendenin and W. A. Wurth, assrs to Standard Oil Development Co. A method for inhibiting corrosion of the inner surfaces of metallic storage vessels.

U.S.P. 2,634,237 (15.4.49; 7.4.53). W. J. Kopf and L. C. Westcott, assrs to Shell Development Co. A rust inhibiting composition containing the following constituents in the following proportions :

	% by wt
Pb naphthenate . . .	0·001 to 2
Pentaerythritol mono-oleate .	0·01 to 5
Mineral oil	Balance

U.S.P. 2,635,698 (16.3.51; 21.4.53). G. H. Rohrback and D. M. McCloud, assrs to California Research Corpn. A method of inhibiting the corrosion of ferrous metal tubing in a producing oil well delivering a production stream.

U.S.P. 2,635,996 (16.3.51; 21.4.53). G. H. Rohrback, D. M. McCloud, and W. R. Scott, assrs to California Research Corpn. A capsulate corrosion inhibitor.

U.S.P. 2,635,997 (21.5.51; 21.4.53). G. H. Rohrback, D. M. McCloud, and W. R. Scott, assrs to California Research Corpn. A hard, dense, macroscopically homogeneous solid prepared by intimately mixing arsenous oxide with an aq soln of sodium hyroxide and cooling the resultant mixture to remove exothermic heat of reaction.

U.S.P. 2,635,999 (22.12.51; 21.4.53). G. H. Rohrback, D. M. McCloud, and W. R. Scott, assrs to California Research Corpn. A hard, dense solid comprising an intimate mixture of arsenous oxide, potassium hydroxide, and water, the ratio by weight of arsenous oxide to potassium hydroxide being in the range from 1·8 : 1 to 5·1, and the water content being at least 1 pt by wt and not more than *ca* 3·0 pts by wt to each 15 pts by wt of arsenous oxide plus potassium hydroxide.

U.S.P. 2,636,000 (22.12.51; 21.4.53). G. H. Rohrback, D. M. McCloud, and W. R. Scott, assrs to California Research Corpn. A solid corrosion inhibitor consisting essentially of an intimate mixture of arsenous oxide, potassium hydroxide, and water. D. A. R.

Engines and Automotive Equipment

1968. Napier Deltic engine. Anon. *Gas Oil Pwr*, 1953, **48**, 133–6.—This engine operates on the 2-stroke opposed-piston principle, with the cyl arranged in an equilateral triangle. The crankshafts are at the corners of the triangle, and the bottom one rotates in a direction contrary to the other two. There is a phase difference of 20° between exhaust and inlet crankshafts, with the former leading, and hence the scavenging and cyl charging arrangements are very efficient. Since each crankpin carries one inlet and one exhaust piston, the loading on each is identical. Each crankshaft carries 6 crankpins, and the resultant 18-cyl engine has a firing interval of 20°, thus giving very smooth running.

The cyl bore is 130 mm and the stroke 184 mm, giving a total swept volume of 88·3 l. The continuous and max ratings are 1875 and 2500 b.h.p. at 1700 and 2000 (crankshaft) r.p.m. respectively, giving a b.m.e.p. of 81·2 and 91·9 p.s.i.

The construction of the engine from cast aluminium cyl blocks and crankcases is described. The exhaust ports extend round about half the circumference at one end, and the inlet ports at the other end extend round the whole circumference and are machined in a tangential direction of entry to impart a swirl to the inlet air. Each cyl has 2 injectors fed from a single pump. The nozzles inject at a wide angle from their axes, thus delivering fuel to the outer edge of the combustion chamber. The pistons are constructed in 2 parts, held together by a spring clip, with an annular space between through which oil flows from the connecting-rod for cooling purposes.

Engine lubrication is on the dry sump principle, with the oil returned by a scavenge pump in a circuit incorporating a seawater heat exchanger and thermostats. Engine cooling water water flows in a closed circuit through seawater heat exchangers.

The 3 crankshafts are coupled through gears so that the power from each crankshaft is transmitted to an output shaft at the centre of the triangle and running slightly above crankshaft speed. Auxiliary equipment is briefly described.

The overall specific weight of the engine is 4·2 lb/b.h.p., and the engine is fitted in a naval patrol boat (*cf* Abs. 1988, **1952**). H. C. E.

1969. Opposed-piston pressure-charged two-stroke [diesel engine]. Anon. *Gas Oil Pwr*, 1953, **48**, 145.—The engine has 10 cyl of bore 7·087 inches and stroke 9·055 inches, giving a total swept volume of 7138 cu. inches. The max rating is 3000 s.h.p. at 975 r.p.m., with a b.m.e.p. of 168·3 p.s.i.

The pistons are of light alloy with steel tops which carry 2 piston rings. Each cyl has two fuel injection valves with separate pumps. The lower cast iron liners have 3 rows of scavenging ports, and the upper liners have rectangular exhaust ports. The lower crankshaft is connected to the propeller shaft by a friction clutch, and the upper crankshaft is geared to the lower by a spur gear train. The engine is scavenged and pressure-charged by a turbo pressure-charger driven by exhaust gas, but at low load additional power is provided from the upper crankshaft. H. C. E.

1970. Development tendencies in construction of spark-ignition engines. E. Dumpert. *Erdöl u. Kohle*, 1953, **6**, 414–17.—General review, with special discussion of cooling problems and advantages of air-cooling, which is becoming increasingly popular in passenger cars. Possible line of development for 2-stroke motors is a direct-lubricated fuel-injection air-cooled design. V. B.

1971. Explosions in enclosed crankcases of reciprocating engines: their cause, effect, and possible remedy. J. Lamb. *Proc. Instn Mech. Engrs*, 1952, **A166**, 327–49.—*Cf* Abs. 1929, **1952**.

1972. Use of heavy fuels for medium-sized marine and stationary diesel engines. J. R. P. Smith. *Proc. Instn Mech. Engrs*, 1952, **A166**, 295–308.—*Cf* Abs. 686, **1953**.

1973. Patents. U.S.P. 2,633,700 (12.4.46; 7.4.53). R. H. Goddard, assr to Daniel and Florence Guggenheim Foundation. A combustion chamber enclosed by surfaces of revolution and of substantially greater outside dia than axial length, means to feed 2 different combustion liq to the chamber, and a plurality of discharge nozzles con-

nected into the outer periphery of the chamber and extending radially outward therefrom and having their outer portions curved to discharge the combustion gases along paths substantially parallel to each other and substantially parallel to the axis of the chamber.

U.S.P. 2,633,704 (14.8.47; 7.4.53). J. O. Sarto, assr to Chrysler Corpn. Fuel–air ratio regulator for gas turbine power plants.

U.S.P. 2,633,795 (30.3.46; 7.4.53). J. C. Hawkins, assr to John Hawkins and Associates Research Laboratory. A sub-combination in a continuous-combustion motor having a combustion chamber, a compressor for supplying air to the combustion chamber, and a gas turbine for driving the compressor.

U.S.P. 2,633,835 (Germany 14.11.49; 7.4.53). E. Flatz, assr to Klockner-Humboldt-Deutz A.G. A directly air-cooled I.C. engine, comprising a combustion cyl having exterior peripheral cooling fins, a cowling substantially enclosing the cyl and a fuel injection valve.

U.S.P. 2,634,578 (19.2.49; 14.4.53). G. W. Kallal, assr to McDonnell Aircraft Corpn. A device for controlling the effective area of an exhaust orifice for an aircraft prime mover.

U.S.P. 2,634,579 (G.B. 24.2.47; 14.4.53). D. Reynolds, V. W. Greenhough, and R. R. Jamison, assrs to Rolls-Royce Ltd. Fuel control device for gas turbines and jet propulsion units.

U.S.P. 2,634,581 (G.B. 23.8.48; 14.4.53). N. H. Kent, assr to Rolls-Royce Ltd. Separate burner system for de-icing the inlets of multiple gas turbine units.

U.S.P. 2,634,710 (Italy 2.9.49; 14.4.53). D. Giacosa, assr to Fiat Societa per Azioni. Propelling unit for motor vehicles.

U.S.P. 2,635,593 (Germany 11.7.49; 21.4.53). A Stoll, assr to Maschinenfabrik Augsburg-Nürnberg A.G. In a 2-stroke I.C. engine with one-sided reversing scavenging, a cyl having a row of admission ports, feed ducts leading to the admission ports, and a row of exhaust ports.

U.S.P. 2,635,594 (8.12.51; 21.4.53). L. C. Wales. 2-cycle diesel engine.

U.S.P. 2,635,423 (28.8.50; 21.4.53). E. J. Oakes and R. K. Rothrock. The method of igniting fuel in an I.C. engine.

U.S.P. 2,635,590 (7.4.49; 21.4.53). F. J. Simon. Apparatus for fuel injection.

U.S.P. 2,635,591 (26.9.49; 21.4.53). E. C. Kiekhaefer. Cooling system for I.C. engines.

U.S.P. 2,635,592 (15.5.50; 21.4.53). J. E. Hollis. Cooling system for I.C. engines.

U.S.P. 2,635,418 (9.11.49; 21.4.53). C. B. Leach, assr to General Motors Corpn. An external manifold for connecting a plurality of exhaust ports spaced along one side of an engine.

U.S.P. 2,635,419 (30.9.48; 21.4.53). J. J. Ambrose and J. Modrovsky, assrs to Curtiss-Wright Corpn of Delaware. A variable discharge nozzle for a jet engine.

U.S.P. 2,635,420 (Netherlands 14.5.47; 21.4.53). F. Jonker, assr to Shell Development Co. Jet propulsion engine with auxiliary pulse jet engine.

U.S.P. 2,635,421 (24.10.49; 21.4.53). F. A. Blum. Pulse jet convertible to ram jet propulsion means.

U.S.P. 2,635,422 (24.4.48; 21.4.53). G. F. Landgraf. Ram jet with steam augmentation.

U.S.P. 2,635,804 (28.12.46; 21.4.53). E. Jedrzykowski, assr to International Harvester Co. Gas turbine.

U.S.P. 2,635,805 (Switzerland 24.9.46; 21.4.53). H. Baumann, assr to A.G. Brown, Boveri & Cie. In a turbine or compressor-turbine assembly for operation by high temp motive fluids, a rotor having a cyl wall carrying blades and radial walls co-operating with the cyl wall to form a closed interior chamber of cyl form, means for cooling a radial wall of the rotor, and gaseous hydrogen confined within the closed chamber under super-atmospheric pressure.

U.S.P. 2,635,848 (28.10.48; 21.4.53). C. M. McDowell, assr to Packard Motor Car Co. Rotor for gas turbines.

U.S.P. 2,636,341 (Switzerland 12.3.46; 28.4.53). A. Buchi. Air-bypass or surge control for supercharged I.C. engines.

U.S.P. 2,636,342 (4.1.49; 28.4.53). G. N. Cade, assr to Phillips Petroleum Co. Method for increasing the thrust of jet engines by the use of rapidly decomposable nitrogen compounds.

U.S.P. 2,636,343 (27.5.49; 28.4.53). E. O. Painter. Reaction propulsion engine.

U.S.P. 2,636,344 (28.10.46; 28.4.53). W. C. Heath, assr to Solar Aircraft Co. I.C. turbine with self-cooling vanes.

U.S.P. 2,636,345 (G.B. 21.3.47; 28.4.53). R. E. Zoller, assr to Babcock and Wilcox Co. Gas turbine combustor having helically directed openings to admit steam and secondary air.

U.S.P. 2,636,487 (7.12.48; 28.4.53). L. E. Fowler. The method of operating a 2-stroke cycle crankcase compression I.C. engine which comprises introducing fuel to the engine and utilizing the crankcase pressure for less than *ca* 20° during the period of *ca* 100° to 140° past top dead centre to regulate the amount of fuel introduced in a subsequent cycle.

U.S.P. 2,636,488 (20.7.52; 28.4.53). O. R. Cedarholm. A carburettor in an I.C. engine having an intake manifold.

U.S.P. 2,636,665 (G.B. 11.3.47; 28.4.53). A. A. Lombard, assr to Rolls-Royce Ltd. Gas turbine engine.

U.S.P. 2,636,666 (G.B. 20.8.47; 28.4.53). A. A. Lombard, assr to Rolls-Royce Ltd. Gas turbine engine with de-icing apparatus.

U.S.P. 2,636,814 (23.12.46; 28.4.53). J. F. Armstrong and J. T. W. Moseley, assrs to Carter Carburetor Corpn. A gas carburetting apparatus for an engine.

D. A. R.

Safety Precautions

1974. Intrinsic safety—its relationship to flameproofing. R. J. Redding. *Elect. Times*, 1953, **124**, 235–9.—Intrinsic safety of elec equipment (whereby energy in possible sparks is limited) is suitable for circuits carrying small currents, is much cheaper than flameproofing, and provides equal safety. It is also applicable to H_2 atm, for which flameproof certificates are not available. Examples of intrinsically safe equipment are described, and circuit diagram of miniature breaker for dangerous areas given. Air purging is another alternative to flameproofing. V. B.

Miscellaneous

1975. Note on the cost of the discovery and exploration of petroleum in U.S.A. R. Granier de Lilliac and G. Lugoi. *Rev. Inst. franç. Pétrole*, Dec. 1952, **7** (12), 439–62.—The first part of the study deals with the expenditure on the discovery and development of oil in the U.S.A. and with the income from the sale of oil. The figures are presented mainly as a cost or receipt per brl of oil. The value of a brl of oil has risen from \$1·09 in 1936 to \$2·56 in 1951. Production costs are estimated to have risen from \$0·22 to \$0·5 in the same period, discovery costs \$0·17 to \$0·78, and development costs \$0·28 to \$0·5. The difference between income and expenditure has risen from \$0·26 to \$0·4 per brl between 1936 and 1951.

It is concluded that the search for, and development of, oil in the U.S.A. is entirely self-financed, despite the rapid expansion of the industry. In addition to financing its own expansion, the industry pays out considerable profits and large sums of money as taxes.

In the second part of the study an analysis of U.S. production trends suggests that $p_n = p_0\ (1{\cdot}04)^n$, where p_0 is the production at zero time and p_n the producing rate after n years. The growth of reserves is given by $r_n = r_0\ (1{\cdot}0375)^n$. It appears that about 1·47 brl of new reserves must be found for each brl produced if the ratio

of reserves to production is 12·5. From an investigation of the number of producing wells drilled since 1918 and the number of wells producing in any year, it is inferred that the average life of a well may be of the order of 27 to 29 yr, but there are extremes ranging 0 to 80 yr. The average discovery may support 62 producers, but, allowing for dry holes, there may be about 80 wells drilled, the drilling generally taking about 3 yr. The mean reserves per discovery may be 9,000,000 brl. The duration of production may be 40 yr. Production curves have been computed, based on these figures and other assumptions. The value of the income has been calculated for various rates of interest, and the costs of discovery and development have been estimated comparably. From these figures it has been concluded that the profit was 13% before tax deductions in the period 1942–51. Elimination of the abnormal years immediately after the war would reduce the profit to 10·7%. G. D. H.

1976. Distribution of petroleum in the U.K.—the changing pattern. T. W. Mathias. *J. Inst. Petrol.*, 1953, **39**, 125–44.—A historical survey of the great changes required in the distributing system for petroleum products from before the first world war, when kerosine was the most important product, through to the present day is presented. The main factors affecti..g the present day distribution of petroleum products are discussed. A. R. W. B.

1977. Growth problems of German oil trade and technology. G. Schlicht. *Erdöl u. Kohle*, 1953, **6**, 413–14.—German oil industry has had 3 phases; prior to 1933, importation of finished products; 1933–45, self-sufficiency, expansion of domestic oilfields, and of coal conversion schemes; since 1945, based on crude refining (30% home production 70% Middle East imports). Academic institutions concerned with pet research are mentioned, and views expressed as to future role to be played by the DGMK (German Society for Petroleum Technology and Coal Chemistry), especially as regards encouragement of students and support of technical education for the oil industry. V. B.

1978. Petrochemicals acquiring uniform nomenclature. M. Alexander. *Oil Gas J.*, 27.7.53, **52** (12), 341.—Tables illustrate rules for nomenclature of paraffin and cyclic hydrocarbons. Abstract practice is also considered. G. A. C.

1979. Report on oil pollution. Anon. *Petrol. Times*, 24.7.53, **57** (1460), 730.—Comments are given on the report of the Committee set up by the Minister of Transport to study oil pollution at sea, which has now been published. G. A. C.

1980. Reclaiming of bituminous waste paper. E. Jayme and F. Branscheid. **Recovery of waste paper contaminated with bitumen, tar, etc.** K. Bucklisch. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (3), 65–70.—These are abstracts of a pamphlet, "Waste paper," published by the *Soc. for promotion of waste paper recovery* (FAPA) e. V. Hessen, price DM 0·50. Pt I contains processing of waste paper by separation of bitumen, fats, etc., economically. Pt II contains project proposals for modern waste paper sorting plant. R. T.

1981. Summarizing—cost of handling and firing coal or fuel oil—3. W. L. Nelson. *Oil Gas J.*, 8.6.53, **52** (5), 141.—This issue gives Tables 3 to 6 inclusive, on costs of oil s.orage and oil-handling, steam required in oil firing plants, and cost of handling oil equivalent of 1 ton of coal. G. A. C.

1982. Characteristics of a spinning-disk liquid sprayer. W. H. Boshoff. *Proc. Instn Mech. Engrs*, 1952, **A166**, 443–6.—In an attempt to increase output of a spinning-disk sprayer without loss of homogeneous drop-size characteristics a 14¼-inch dia disk was designed and determinations made at 600 to 200 r.p.m. Critical flow rate for production of uniform-size drops is 6 to 22 cc/sec, and drop size is inversely proportional to speed. Between 22 to 110 cc/sec distribution and drop size are independent of liquid feed rate. G. S.

ADDITIONS TO THE LIBRARY

A Survey of Australian Engineering Research. The Institution of Engineers, Australia, 1952. Pp. 62.

A compilation of information concerning research organizations in Australia, subdivided into groups and provided with a classified subject index.

Analyses of Formation Brines in Kansas. C. G. Roll and J. Wright. U.S. Bur. Mines Rept. Invest. 4974, May 1953. Pp. 40.

Detailed analyses of over 600 brines from various fields and formations in Kansas. Methods of sampling and analysis are indicated.

National Annual Survey of Aviation Gasoline and Aviation Jet Fuel, 1952 Production. O. C. Blade. U.S. Bur. Mines Rept. Invest. 4982, May 1953. Pp. 20.

Statistical Year-book of the World Power Conference. No. 6 (1948–50). Edited by F. Brown. London: World Power Conference, 1953. Pp. 163. £1 15*s.* net.

Includes statistics for petroleum, benzoles, alcohols, and natural gas.

Wavefront Charts and Raypath Plotters. A. W. Musgrave. Golden, Colorado: Colorado School of Mines, 1952. Pp. 60 + viii. $1.00.

A Study of Asphalts and Asphaltic Materials. G. W. LeMaire. Golden, Colorado: Colorado School of Mines, 1953. Pp. 89 + v. $1.50.

Proceedings of the Institution of Mechanical Engineers. Vol. A166, 1952. Pp. 478 + viii.

Improvement of Oil Gas Substitutability for Natural Gas by Pressure Gasification. D. L. Nicol, J. J. Guyer, E. F. Searight, and H. R. Linden. Chicago: Institute of Gas Technology, 1953. Pp. 36 + iv. $2.50.

An interim report of studies on the possibility of using oil gases to substitute or supplement natural gas to meet peak loads. The present work indicates that oil gases are improved if produced under moderately high pressures to increase methane and ethane content and decrease hydrogen and ethylene content.

Thermodynamic Properties of Nitrogen. O. T. Bloomer and K. N. Rao. Research Bulletin 18. Chicago: Institute of Gas Technology, 1952. Pp. 28 + iv. $3.50. Supplementary charts (2), $3.50.

For the design of plant to separate nitrogen from natural gas accurate thermaldynamic data on nitrogen are required. The properties of nitrogen have been recalculated from recent data, and figures are given for specific volume, enthalpy, entropy, and fugacity-to-pressure ratio. Range is from saturated liquid at −320·4° F to superheated vapour at 500° F, and 10 to 1500 p.s.i.a.

The supplementary charts (22 × 34 inches each) are a Mollier chart and a compressibility chart for nitrogen. Both are reproduced full scale.

Water Flooding in the Oilfields of Anderson, Franklin, Linn, and Miami Counties, Kansas. J. P. Powell and J. L. Eakin. U.S. Bur. Mines Rept. Invest. 4991, June 1953. Pp. 111.

Directory of Australian Scientific and Technical Research Centres. G. J. Wylie and N. F. Lowe. Melbourne: Commonwealth Scientific and Industrial Research Organization, 1953.

A handbook of nearly 300 Australian research centres in the pure and applied sciences, including medicine.

Summary of Water Flood Operations in Illinois Oil Pools during 1951. P. A. Witherspoon and P. J. Shanor. Urbana, Illinois: State Geological Survey Circular 182, 1953. Pp. 17.

33rd Annual Report of the Research Council of Alberta. Edmonton: Research Council of Alberta, 1953. Pp. 36. 5 cents.

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Dumont, L. F., 2048
Dunn, J. H., 2027
du Pont de Nemours, E. I., and Co., 2019

Eddington Metal Speciality Co., 2055
Eddy, L. P., 2020
Eisler, J. D., 1983
Etherington, L. D., 2009
Ethyl Corpn, 2027
Evering, B. L., 2011

Faldix, P., 2073
Farbenfabriken Bayer, 2027, 2067, 2071
Farbwerke Hoechst, 2067
Farrell, J. E., 2055
Farspan Industries Inc, 2055
Fellous, J., 2052
Finch, H. de V., 2027
Fischer, E., 2022
Forsythe, W. L., 1989
Foxwell, G. E., 2093
Franck, H.-G., 2064
Frese, A., 2071
Fuchs, W., 2072
Furman, K. E., 2027

Gaines, J. M., 2055
Gally, S. K., 2078
Gatz, D. L., 2055
Gier, T. E., 2010
Gilbert and Barker Manufacturing Co., 2055
Gilliland, E. R., 1990
Giuliani, P., 2013, 2053
Goddard, E. H., 2090
Goldschmidt, T., 2036
Goodrich, B. F., 2019
Grayson, M., 2020
Gregg, R. A., 2019
Grodde, K. H., 2041
Groebe, J. L., 2009
Gross, H. H., 2022
Gulf Oil Corpn, 2055
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Habermann, C. E., 2079
Hall, H. T., 2043
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Ham, G. E., 2019
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Hartman, H., 2006
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Hedges, R. O., 2055
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Henry, R. L., 2008
Herd, M., 2054
Hill, J. B., 2044
Hintze, A. J., 1983
Holloway, F. A. L., 2019
Holmes, R. L., 2022
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Hootsen, A., 2079
Hougen, J. O., 2010
Howe, R. F., 2019
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Kehde, H., 2009
Keith, P. C., 2014
Kemp, L. C., 2023
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Klueger, J. E., 2022
Koffman, J. L., 2082
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Kurtz, P., 2027

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Langlois, G. E., 2018
Lash, C. C., 1983
Lauer, B. E., 2005
Lauwerier, H. A., 1993
Lechthaler, C. H., 1997
Lewis, E. H., 2022
Linn, N. F., 2022
Littman, T. M., 2031
Lovell, W. G., 2049

McCandless, E. L., 2055
McClure, F. T., 2034
McDonald, G. E., 2030
McKee, L. C., 2055
Mackie, W. F., 2000
MacSporran, C., 2090
Mansfield, W. P., 2083
Marschner, R. F., 2011
Marshall, J. A., 2012
Marwil, S. J., 1984
Masiam, F. D., 2031
Mason, E. A., 1990
Matuszak, M. P., 2019
Messiez-Poche, J., 2079
Miller, A. J., 2009
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Mitchell, J. M., 2019
Möller, H., 2021
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Murphy, J. K., 2055
Muskat, M., 1985
Myers, D. N., 2066
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Nelson, J. F., 2019
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Newby, W. E., 2048
Niclause, M., 2035
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Oliver, R. C., 1990
Opfell, J. P., 2032
Otvos, J. W., 2017

Pall, D. B., 1992
Pan American Refining Corpn, 2019
Pauls, J. T., 2061
Payne, J. W., 1997
Peabody Engineering Corpn, 2055
Pearsall, H. W., 2020
Pennington, E. N., 1984
Perfection Stove Co., 2055
Peters, J. C., 2055
Phillips Petroleum Co., 1983, 2009, 2019, 2090
Pickles, D., 2056
Pilar, J., 2075
Pines, H., 2019
Pluys, P., 2079
Polymer Corpn, 2019
Potter, R. L., 2090
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Quill, J. S., 1986

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Reed, H. C., 2009
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Reppe, W., 2027
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Ruys, D. T., 2079
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Schlatter, M. J., 2027
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Schwartz, C. E., 1994
Scirocco, —, 2079
Scott, A. K., 2022
Seismograph Service Corpn, 1983
Selleck, F. T., 2032
Sewell, B. W., 1983
Shapiro, H., 2027
Shell Development Co., 2019, 2027
Sherwood, P. W., 1988, 2025, 2068, 2070
Siemon, R. H., 2055
Silverman, B., 1983
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Simonetti, —, 2079
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Sommer, H. J., 2019
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Stage, H., 2073
Standard Oil Co., 2022, 2071, 2090
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Stark, B. J., 2046
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Swanson, P. F., 2094

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Temme, F., 2063
Temple, K. L., 2027
Texaco Development Corpn, 2022
Thomas, H., 2090
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Thornton, D. P., 2002
Thorpe, T. C. G., 2055
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Townend, D. T. A., 2033
Trotter, P. W., 2027

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United States Rubber Co., 2019
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Oilfield Exploration and Exploitation

Geophysics and Geochemical Prospecting

1983. Patents. U.S.P. 2,630,188 (11.1.47; 3.3.53). J. E. Hawkins and W. E. Pugh, assrs to Seismograph Service Corpn. Seismic waves are generated in the earth with suppression of the horizontal propagation of undesired waves of a predetermined frequency, by detonating charges in a number of holes arranged in a specified manner dictated by the predetermined frequency.

U.S.P. 2,630,618 (20.1.51; 10.3.53). B. W. Sewell, assr to Standard Oil Development Co. Seismograph handler.

U.S.P. 2,632,150 (23.2.49; 17.3.53). D. Silverman, J. D. Eisler, and C. C. Lash, assrs to Stanolind Oil and Gas Co. Marine seismic surveying.

U.S.P. 2,632,520 (1.8.49; 24.3.53). A. J. Hintze, assr to Phillips Petroleum Co. Apparatus for producing seismic waves in water. J. M. S.

Production

1984. Prediction of liquid–liquid phase equilibria. E. N. Pennington and S. J. Marwil. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1371–7.—Mutual solubility data for 13 hydrocarbon–solvent binary systems and ternary data for 2 hydrocarbon–solvent

systems are presented. A correlation for predicting component distribution in a multi-component system is also given. E. J. C.

1985. Oil recovery—100 per cent? M. Muskat. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1401–5.—Various types of oil-producing mechanisms and their physical limitations with respect to recovery are reviewed. The basic physiochemical reason behind failure to obtain 100% oil recovery lies in the phenomena of fluid immiscibility and interfacial forces. Theoretical suggestions are made for overcoming these limitations to increase recovery. They include vaporization of oil phase by high pressure gas injection and subsequent cycling, displacement of oil by immiscible liq, such as liquefied petroleum gases, and use of additives during water flooding to reduce greatly interfacial tension between oil and water. E. J. C.

Transport and Storage

1986. Gas turbines and centrifugal compressors as applied to natural gas pipe line service. T. R. Rhea and J. S. Quill. *Mech. Engng, N.Y.*, July 1953, **75** (7), 534.—Gas turbine-driven single-stage centrifugal compressors are being applied to the El Paso natural gas system in order to increase the flow from 700 to 1100 million standard cu.ft/day. Each unit generates 5000 h.p., and the gas turbine stations are located approx 25 miles apart between existing reciprocating stations. The economics of station spacing is discussed, and the flexibility of adjustable-speed centrifugal compressors for this application is illustrated. The gas turbines are 2-shaft adjustable-speed sets, with heat exchangers, rated at 5000 h.p., 5000 r.p.m. at 80° F ambient temp and 1000 ft altitude, with an efficiency of 25%. Details of the plant and its operation are given. Advantages of gas turbine-driven compressors in this application are : low maintenance and operating costs, possibility of short station spacing, increase in turbine output in winter, no water requirements, low lub oil consumption, and flexibility. 2 refs. T. T.

1987. Fully automatic drum-cleaning equipment. G. Sinn. *Erdöl u. Kohle*, 1953, **6**, 323–5.—Fully enclosed automatic drum washer (1 or 2 drums) is described in detail, with lay-out of installation and operating cost analysis. Unit plant (1 drum) can handle 12 drums/hr, one operator can control 5 units. Normal sequence is steam, hot water, hot NaOH (2%), rinse, air dry, but org solvent can be substituted for NaOH. Cleaning fluid is recirculated, so that even expensive solvents can be used. Cost per drum can be as low as 85 pf. Floor area of 1-drum unit is 2·5 sq. m. V. B.

1988. Advances in tank construction. P. W. Sherwood. *Erdöl u. Kohle*, 1953, **6**, 270–2.—Storage tanks can be divided into 3 types, high (>2 atm), medium (0·2–2 atm) and atm (⩾0·2 atm) pressure. Main recent progress has been in first group, latest type of which is the icosasphere (20-sided). Insulated tanks enable lesser strength requirements to be prescribed if temp of tank contents can be restricted. For atm tanks developments have been on lessened evap loss and fire risk, variations of the floating roof type being double pontoon construction and the double-walled roof. The expansion roof (analogous to the conventional gas holder) is also being developed, but is expensive ; an alternative is to link a fixed roof tank with an expansion tank. V. B.

Refinery Operations

Refineries and Auxiliary Refinery Plant

1989. Flow properties of fluidized solids. R. Dickman and W. L. Forsythe, Jr. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1174–7.—Laboratory apparatus and method described by which experimental data could be used to predict dense-phase flow of fluidized cat in commercial standpipes. E. J. C.

1990. Gas-flow patterns in beds of fluidized solids. E. R. Gilliland, E. A. Mason, and R. C. Oliver. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1177–85. E. J. C.

1991. Reaction rates in catalytic cracking of petroleum. F. H. Blanding. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1186–97.—Data obtained by cat cracking various feeds in small scale cyclic fixed-bed units are presented. It is shown that reaction

velocity constants of cracking cat are initially high, but rapidly fall with coke formation, the rate of fouling depending on the cat itself. A new method of assessing the conversion, the "20 + conversion," is defined, and stated to be useful in assessing extent of the reaction. E. J. C.

1992. Filtration of fluid catalyst fines from effluent gases. D. B. Pall. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 1197–202.—Describes the use of porous stainless steel filters for removing cat fines from gases. Information given for designing pilot plants and for scaling up to commercial sizes. E. J. C.

1993. Diffusion in a fluid moving at uniform velocity in a tube. A. Klinkenberg, H. J. Krajenbrink, and H. A. Lauwerier. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 1202–8.—A mathematical study. E. J. C.

1994. Flow distribution in packed beds. G. E. Schwartz and J. M. Smith. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 1209–18.—Apparatus described for investigating variation of velocity across packed beds. For pipe sizes 2–4 inches, max velocity was approx one pellet dia away from wall. Velocity variations which occur may be important in analysing the operation of cat reactors or packed-bed heat exchangers. E. J. C.

1995. Diffusion in beds of porous solids. P. F. Deisler, Jr., and R. H. Wiehelm. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 1219–27.—Apparatus and procedure described for investigating importance of diffusion effects in determining temp and concn gradients in cat reactions. Frequency response method was used in taking measurements. E. J. C.

1996. Heat and mass transport in a fixed catalyst bed during regeneration. J. J. van Deemter. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 1227–33.—Theoretical study of above processes. E. J. C.

1997. Countercurrent heating and cooling of granular solids with gases. J. W. Payne, C. H. Lechthaler, and R. D. Drew. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 1233–6.—Several systems involving direct countercurrent heat exchange between solids and gases are described, *e.g.*, tempering operation in manufacture of bead cat, and a shale retorting process. E. J. C.

1998. Mechanism of heat transfer in fluidized beds. C. van Heerden, A. P. P. Nobel, and D. W. van Krevelen. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 1237–41.—Theoretical considerations are presented and some experiments reported on heat transfer in fluidized beds. E. J. C.

1999. Focus on plant maintenance. G. E. Halter. *Inst. Petrol. Rev.*, 1953, **7** (80), 264.—Maintenance is an essential service to production. The author quotes the considered view of the British Productivity Team which visited the U.S.A. to study plant maintenance in 1952, and develops from these conclusions the various aspects of plant maintenance. These can be classified into 5 types: (1) controlled by production supervision; (2) breakdown maintenance; (3) scheduled maintenance; (4) planned maintenance; (5) Preventive maintenance. Each of these is explained, and method, technique, and financial control discussed. Associated subjects are enumerated and detailed, including corrosion, lubrication, process schedules, plant protection and inspection, plant spares, and safety precautions. R. H.

2000. Pioneering a refinery—the story of Cardon, Venezuela. W. F. Mackie. *Inst. Petrol. Rev.*, 1953, **7** (80), 259.—The erection of a large refinery abroad is a 2-fold project. In addition to the actual technical development, there is the social development—houses, schools, hospitals, and churches—which must proceed side by side as an integral part of the development. The Cardon project is one of the most outstanding examples of this kind. There were many difficulties of water supplies, power supplies, port facilities, roads and railways, etc., due to the primitive nature of the area. Details of the various aspects are given, including the geographical situation, the size of the project, and the non-technical provisions (schools, restaurant, bakery, sports facilities, cinema, etc.). Construction started in Apr. 1945, and the chronological development is detailed up to date.

The refinery includes 16 major units covering the distillation, thermal cracking, reforming, polymerization and treating, and lub oil manufacture, and has at the moment an oil output of 170,000 b.d. R. H.

2001. New flare stack design. Anon. *Petrol. Process.*, 1953, **8** (6), 884–6.—Details are given of the 5 new flare stacks that have been erected at the Anglo-Iranian Co.'s refineries in the U.K. These stacks are 250 ft high and 2 ft in diameter, and the masts are 235 ft high. The appearance of the flare stacks with their steel lattice resemble a TV mast. Each mast's weight, 32½ tons, is supported on a single rocker bearing, giving the structure free movement in high winds. The cross-sectional area of the stacks is based on a max rate of waste gas flow of 1½ million cu.ft/hr. Electrically-operated flame propagation units are installed at the top of the stacks to re-ignite the pilot flares in case of failure. J. W. H.

2002. Refining in Mexico. Pt 5. The Tampico and outlying plants. D. P. Thornton. *Petrol. Process.*, 1953, **8** (5), 847–7.—The 3 pre-1938 refinieries in the Tampico area process 4 crudes, including Poza Rica crude. The largest, the Madero refinery, processing 51,500 b.d. of crude, is the only one in the group that has been modernized in part since construction. The scheme of processing at the Madero refinery is given, showing the different proportions of crude intakes. The 30,000 b.d. topping unit, designed and built by Pemex, is the biggest unit in the refinery, and the construction of cat cracking facilities to charge 15–20,000 b.d. will shortly be under way.

A study of refining conditions in Mexico has revealed the many difficulties imposed on the Mexican refiner, both by geography and sociological conditions. Pemex has been hampered by the lack of funds with which to re-create a refining industry to serve the industrially-awakening nation's requirements, also by the need to find new oil reserves to replace those which have been in use for the past 30 years. J. W. H.

2003. Is your piping system right? W. M. Jackson. *Petrol. Process.*, 1953, **8** (6), 868–73.—A time-saving method is presented for the determination of branch reinforcing needs. The 90°-joint connecting branch and header is more susceptible to external stresses, corrosion, and failure hazards than other connections in piping systems. The majority of designers leave the reinforcing of such branch connections to the pipe fabricators, who only reinforce in the bare minimum of cases.

The determinations of when and where to reinforce these connexions are made easier by the use of nomographs. 2 such nomographs are presented, giving the necessary information in accordance with the requirements of the American Standard Code for Press. Piping, for standard wall pipe and extra strong wall pipe branches and headers. J. W. H.

2004. Pump selection—6. R. L. Jacks. *Oil Gas J.*, 3.8.53, **52** (13), 97.—This issue of the Engineering Reference Section specifies suction and discharge conditions at pump and also deals with flow rate. G. A. C.

2005. Heat transfer. B. E. Lauer. *Oil Gas J.*, 3.8.53, **52** (13), 101.—Pt 39 of this series continues with coeff of heat transfer through film between outside of a coil and a liq, and between surface of a warm coil and cool gas or liq. G. A. C.

2006. Reconstruction and expansion of German refineries. Vacuum refinery Bremen-Oslebshausen. H. Hartmann. *Erdöl u. Kohle*, 1953, **6**, 385–9.—Total capacity is now over 700,000 tons/year, feed being both German and imported (Middle East) crude. Main unit is TCC with crude charge capacity of 10,000 b.s.d. Bead cat used is manufactured at Nienburg, and consumption is 1–1½ tons/day. Lub oil plant is also in operation. V. B.

Distillation

2007. To help you design fractionators. Pt 4. Stripping and rectifying of multi-component systems. R. R. White. *Petrol. Process.*, 1953, **8** (6), 892–6.—The analysis of quaternary mixtures is extended to include systems of N components. The calculation is carried out of the min reboil ratio required to strip a 5-component mixture to produce bottom products of various specifications.

With the introduction of feeds other than saturated liq or vapours to the stripping column, it is necessary to locate the equilibrium tie line which extrapolates through the feed point. The method of calculating the comp of the liq end on this tie line by the use of enthalpy data is discussed. J. W. H.

2008. Binary vapour–liquid equilibria. A. Rose, E. T. Williams, W. W. Saunders, R. L. Henry, and J. F. Ryan. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1568–72.—Method described for predicting equilibrium vapour and liq compositions based on b.p.–composition data, and vapour pressure–temp data of the pure components. E. J. C.

Absorption and Adsorption

2009. Patents. U.S.P. 2,630,191 (28.10.46; 3.3.53). E. B. Miller, assr to Jefferson Lake Sulphur Co. Cyclic adsorption process for removing water and condensable hydrocarbons from natural gas.

U.S.P. 2,630,402–3 (10.6.49; 3.3.53). A. J. Miller and J. L. Groebe, assrs to Phillips Petroleum Co. Methods of separating gaseous hydrocarbons using an absorption oil and adsorption charcoal.

U.S.P. 2,630,876 (6.11.47; 10.3.53). H. Kehde, assr to Union Oil Co of California. Control of gas product streams in the separation of normally gaseous mixtures by selective adsorption.

U.S.P. 2,630,877 (15.11.48; 10.3.53). C. H. O. Berg, assr to Union Oil Co of California. In the separation of gas mixtures with a solid adsorbent, the hot adsorbent, after being stripped, is cooled by indirect heat exchange with a cooling medium and by passing a portion of the lean gas through it to desorb the stripping gas.

U.S.P. 2,631,727 (27.12.49; 17.3.53). M. T. Cichelli, assr to Gulf Research and Development Co. Continuous process for separating a liq mixture by selective adsorption.

U.S.P. 2,632,528 (27.9.47; 24.3.53). C. H. O. Berg, H. C. Reed, and F. L. Hartley, assrs to Union Oil Co of California. Carbon monoxide is separated from gaseous mixtures using a solid granular adsorbent impregnated with a metal of the iron group of group VIII of the periodic table.

U.S.P. 2,632,726 (22.7.49; 24.3.53). C. R. Ringham and R. K. Simms, assrs to Phillips Petroleum Co. Method of guarding selective adsorption separation systems.

U.S.P. 2,633,207 (13.4.49; 31.3.53). L. D. Etherington, assr to Standard Oil Development Co. Adsorption–fractionation process for gaseous mixtures. J. M. S.

Solvent Extraction and Dewaxing

2010. Concentration gradients in spray and packed extraction columns. T. E. Gier and J. O. Hougen. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1362–70.—Apparatus and experimental procedure reported for obtaining overall transfer data in extraction columns. System used was adipic acid–ether–H_2O, and data are given in form of acid concn at various column heights. E. J. C.

Cracking

2011. Decomposition of *n*-octane catalysed by bromides. R. F. Marschner and B. L. Evering. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1487–90.—At 500°–570° C *n*-octane was cracked in the presence of small percentages of hydrogen bromide or bromo-butane. Each substance was found to catalyse the reaction, and this was attributed to the effect of bromine atoms. E. J. C.

2012. Fluid bed catalytic cracking unit. J. A. Marshall and J. W. Askins. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1063–8.—Describes in detail a bench-scale pilot plant for the continuous cracking of up to 0·65 g.p.h. of feed. E. J. C.

2013. Thermal reforming of naphtha pre-treated by extractive crystallization with urea. P. Boutaud de La Combe and P. Giuliani. *Rev. Inst. franç. Pétrole*, 1953, **8**, 355–61.—Two charge materials (150°–250° C), Kuwait reforming stock (d_4^{15} 0·792, O.N. (F_2) 13, *n*-paraffins 18%) and raffinate (d_4^{15} 0·801, O.N. (F_2) 32, *n*-paraffins 3%) obtained therefrom by urea treatment were reformed in pilot plant under various operating conditions. For same O.N. (F_2), yield from raffinate showed improvement of 7–9% or, for same yield, O.N. (F_2) improvement was 7–10 as compared to untreated reforming stock. Gas yield (10–14%) and olefin content (22–35%) of reformed gasoline from raffinate is less than from untreated reforming stock (gas 13–21%, olefins in gasoline 34–47%). *n*-Paraffin enriched extract can be cracked to high-olefin gas, which is suitable feed for petrochemical processes. V. B.

2014. Modern catalytic cracking. P. C. Keith and S. C. Schuman. *Erdöl u. Kohle*, 1953, **6**, 252–9.—Fundamentals (cat structure, carbonium ion cracking mechanism) are reviewed and details (with flow diagrams) given of following processes: TCC, airlift TCC, Houdriflow, fluid cat cracking. Typical refinery yields are tabulated. Average conversion is 55–60 vol % at operating temp of 475° C. U.S.A. cat cracking capacity will increase in next 5 years, although it may form smaller proportion of total refinery capacity. Further outlook depends on development of residue-cracking processes. V. B.

2015. Patent. Ger.P. 872,938, 26.2.53. O. Dorschner, assr to Metallges. A.G., Frankfurt (Main). Process and installation for exothermic cat gas reactions. *BrennstChemie*, 1953, **34** (7–8). R. T.

Hydrogenation

2016. Oxides of the transition metals as catalysts. A. Clark. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1476–80.—Evidence from hydrogen–deuterium exchange measurements indicates that hydrogenation–dehydrogenation reactions over oxides of the type silica, alumina, chromia–alumina, etc., are associated with presence of excess metal ion in the oxide structure. Often the same cat will promote isomerization and polymerization reactions, indicating a bifunctional cat surface. E. J. C.

2017. Hydrogenation of olefins over metals. J. N. Wilson, J. W. Otvos, D. P. Stevenson, and C. D. Wagner. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1480–7.—In a study of the mechanism of cat hydrogenation olefins were treated over a commercial nickel cat with a large excess of pure deuterium, and the isotopic composition of the products was determined by mass spectrometry. The product of the reaction between *cis*-2-butene and deuterium at −78° C contained all isotopic species from C_4H_{10} to C_4D_{10} in an essentially random distribution of the deuterium atoms among the hydrogen positions, even though the average composition of the product was close to $C_4H_8D_2$. This suggests that at low temp both alkane formation and the redistribution of hydrogen atoms among chemisorbed hydrocarbon species occur largely by elementary reactions in which a hydrogen atom is transferred from one chemisorbed hydrocarbon fragment to another, rather than by reactions involving chemisorbed hydrogen atoms directly. At higher temp exchange reactions with chemisorbed hydrogen become more prominent. On the basis of these observations and the results of other investigators, a mechanism is proposed for the cat hydrogenation of olefins over metals, which provides for competition among a number of elementary reactions. The detailed course of reaction under a particular set of conditions will depend on the effects of temp, pressure, ratio of olefin to hydrogen, and cat on this competition. Cat hydrogenation is of limited utility for the preparation of specific isomers of deuterium-labelled paraffins, even when only the stoichiometric quantity of deuterium reacts with an olefin.
(Authors' Abstract.)

Polymerization

2018. Olefin polymerization with acid catalysts. G. E. Langlois. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1470–6.—Polymerization of olefin hydrocarbons with acidic cat is reviewed, and more important industrial applications described. Polymerization is recognised as being of 3 types: (*a*) true polymerization; (*b*) hetero-polymerization which yields olefins which are non-integral multiples of the polymer; and (c) conjunct

polymerization when products are paraffins, polyolefins, and cyclic compounds. Mechanisms of various reactions are proposed. E. J. C.

2019. Patents. U.S.P. 2,630,422 (22.11.49; 3.3.53). M. M. Brubaker, assr to E. I. du Pont de Nemours and Co. Carbon monoxide and ethylene are interpolymerized in the presence of an alkanol to form a polymeric hydroxy keto ester which is reduced to the corresponding polymeric hydroxy ester.

U.S.P. 2,630,426 (9.6.50; 3.3.53). C. A. Uraneck and S. H. Landes, assrs to Phillips Petroleum Co. Synthetic rubber is produced by the emulsion polymerization of 1 : 3-butadiene using as the emulsifying agent potassium abietate which has been treated in aq soln having pH>7 and at a temp between 100° F and the b.p. of the soln, with hydrogen peroxide.

U.S.P. 2,631,142 (15.6.49; 10.3.53). H. L. Williams and J. M. Mitchell, assrs to Polymer Corpn. Polymers and copolymers of 1 : 3-butadiene are made in aq emulsions at low temp in the presence of a water-soluble organic chelate complex of a salt of ethylene dinitrilo tetra-acetic acid and iron and an alkali metal.

U.S.P. 2,631,175 (23.12.48; 10.3.53). W. W. Crouch, assr to Phillips Petroleum Co. Liq polymers of 1 : 3-butadiene are made using a stable dispersion of finely divided alkali metal in a liq hydrocarbon as cat.

U.S.P. 2,631,176 (12.9.47; 10.3.53). R. L. Heinrich, assr to Standard Oil Development Co. α-mono-olefins having < 4 carbon atoms are polymerized in the presence of an aluminium halide at 75° to 250° F, an alcohol, ketone, peroxide, aldehyde, or organic acid being added to the mono-olefin during polymerization.

U.S.P. 2,631,996 (20.12.51; 17.3.53). F. T. Wadsworth, assr to Pan American Refining Corpn. Normally liq unsaturated hydrocarbons are polymerized in the presence of BF_3 and iodine.

U.S.P. 2,632,031 (29.11.48; 17.3.53). M. P. Matuszak, assr to Phillips Petroleum Co. *iso*Octanes are produced by reacting liq HF, *iso*butane, and *cyclo*propane at 100° to 200° F.

U.S.P. 2,632,777 (6.1.49; 24.3.53). H. Pines, assr to Universal Oil Products Co. A mixture comprising 2 mol of decahydronaphthalene and 1 mol of an olefinic hydrocarbon is polymerized at 0° to 200° C in the presence of a cat. J. M. S.

U.S.P. 2,635,090 (23.7.49; 14.4.53). C. H. Basdekis, assr to Chemistrand Corpn. Method of preparing acrylonitrile polymers.

U.S.P. 2,635,092 (22.10.49; 14.4.53). G. E. Ham, assr to Chemistrand Corpn. A copolymer of 80–95% by wt of acrylonitrile and 5–20% of a compound of the group consisting of the methallyl and allyl esters of a mono-chloro- or mono-bromo-substituted saturated aliphatic monocarboxylic acid containing up to 8 carbon atoms.

U.S.P. 2,636,016 (11.10.49; 21.4.53). C. F. Van Gilder, assr to Standard Oil Development Co. Polymerizing at *ca* 0° F and in the presence of *ca* 0·19–5% of a Friedel–Crafts cat a mixture of butadiene and di-*iso*butylene to give a reaction mixture containing the solid polymer, adding a high boiling solvent naphtha in which the polymer is soluble, to make a 40% soln of resin, diluting the soln of polymer with from 5 to 10 vol % based on the naphtha soln of resin of a monohydric aliphatic alcohol having from 1 to 4 carbon atoms, and filtering the resultant mixture to recover a clear polymer soln.

U.S.P. 2,636,018 (10.7.46; 21.4.53). L. C. Rubens and R. F. Boyer, assrs to Dow Chemical Co. A resin-forming composition useful for producing a cast electrical insulating resin and comprising styrene and an alkyd resin.

U.S.P. 2,636,024 (15.10.49; 21.4.53). R. J. Wolf, assr to B. F. Goodrich Co. A tripolymer made by polymerizing in aq emulsion at about 0° C, a monomeric mixture consisting of from 45 to 80% by wt of vinyl chloride, from 10 to 30% by wt of vinyl acetate, and from 5 to 35% of 2-ethylhexyl acrylate.

U.S.P. 2,636,025 (11.10.49; 21.4.53). R. F. Howe and F. A. L. Holloway, assrs to Standard Oil Development Co. Method for starting low-temp *iso*-olefin polymerization after solvent-cleaning the reactor.

U.S.P. 2,636,026 (1.6.51; 21.4.53). J. F. Nelson, assr to Standard Oil Development Co. A process for carrying out polymerization of olefins below −10° C.

U.S.P. 2,636,028 (24.3.50; 21.4.53). H. J. Sommer, T. B. Albin, and P. H. Williams, assrs to Shell Development Co. An *N*-acyl-*N*-acyloxy-substituted polymeric condensation product of epichlorohydrin and ammonia.

U.S.P. 2,636,029 (21.13.48; 21.4.53). H. S. Bloch, assr to Universal Oil Products Co. A process which comprises reacting sulphur at a temp of from *ca* 125° to *ca* 275° C with a conjunct polymer mixture of polyolefinic, cyclic hydrocarbons having an average number of double bonds per mol of from *ca* 2·5 to *ca* 4, of which from *ca* 40 to *ca* 70% are conjugated.

U.S.P. 2,636,866 (29.6.49; 28.4.53). F. W. Banes, D. W. Young, and A. J. Hund, assrs to Standard Oil Development Co. A composition of matter comprising 100 parts of a resinous copolymer of *ca* 95 wt % of vinyl chloride and 5 wt % of vinyl acetate; *ca* 50 parts of a flexible, oil-resistant, resinous, thermoplastic tripolymer of *ca* 15 wt % of combined *iso*butylene, *ca* 30 wt % of combined butadiene-1 : 3 and *ca* 55 wt % of combined acrylonitrile; *ca* 50 parts of di-2-ethylhexyl phthalate; *ca* 3 parts of basic lead carbonate; and *ca* 1·5 parts of stearic acid.

U.S.P. 2,636,874 (9.11.50; 28.4.53). R. A. Gregg, assr to United States Rubber Co. A soluble, fusible, unsaturated, halogen-containing resin which is a polymerized reaction product of 2-alkenoxyalkyl esters and bromomethanes.

U.S.P. 2,636,910 (22.4.49; 28.4.53). W. W. Crouch, assr to Phillips Petroleum Co. Sulphur dioxide treatment of a liq polybutadiene produced by soln polymerization of 1 : 3-butadiene in the presence of an alkali metal cat and which is discoloured by resulting organic compounds of the alkali metal. D. A. R.

Alkylation

2020. Friedel–Crafts alkylation reaction catalysts and complexes. H. C. Brown, H. W. Pearsall, L. P. Eddy, W. J. Wallace, M. Grayson, and K. LeRoi Nelson. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1462–9.—A detailed study is reported of the alkylation of aromatic hydrocarbons with and without the presence of hydrogen halides, and complexes of Friedel–Crafts cat with alkyl halides. A mechanism is proposed to account for the products of the reactions. E. J. C.

Chemical and Physical Refining

2021. Continuous hot-contact plant with precoat filter for clay treatment of lubricating oils. H. Möller. *Erdöl u. Kohle*, 1953, **6**, 390–2.—Flow-sheet and illustrated description. After clay addition (up to 6%) oil–clay slurry is passed through heat exchangers to tube-furnace (up to 300° C) and then to foaming tower, which can also act as stripper; part of slurry is recirculated back to oven. Rotary (6–18 revs/hr) drum filter operating in inert gas (CO_2) atmosphere is pre-coated with 40–60 mm kieselguhr, as excess earth is scraped off filter pre-coat gradually (1 week or more) thins to 10–15 mm when it is renewed. Press capacity is 0·3 tons/m²/hr. Oil is recovered from spent clay. V. B.

2022. Patents. U.S.P. 2,631,121 (13.8.49; 10.3.53). N. F. Linn, A. K. Scott, and W. H. Rupp, assrs to Standard Oil Development Co. Hydrocarbons are sweetened by contacting with an aq soln having a hypochlorite content of 1–12 g/litre, a sodium hydroxide content of 100–300 g/litre, and a sodium chloride content of 50–100 g/litre.

U.S.P. 2,631,122 (1.8.50; 10.3.53). B. R. Strickland and E. H. Lewis, assrs to Standard Oil Development Co. Cat cracked dist are stabilized by contacting with aq caustic soda soln in the absence of oxygen.

U.S.P. 2,631,125 (9.2.50; 10.3.53). R. C. Danison, assr to Diamond Alkali Co. A soln of chlorinated paraffin wax in a solvent (I) is contacted with glycerol, ethylene glycol, or propylene glycol at a temp above the b.p. of (I). The chlorinated paraffin wax obtained has increased stability.

U.S.P. 2,631,969 (8.2.49; 17.3.53). J. E. Klueger, assr to Standard Oil Co. Apparatus for treating mineral oils with clay.

U.S.P. 2,631,982 (9.3.51; 17.3.53). J. W. Donegan, assr to Allied Chemical and Dye Corpn. Finely divided particles suspended in coal tar, water-gas tar, oil-gas tar, or their pitches are removed by mixing the tar or pitch with a hydrocarbon boiling with the range 125°–500° F, carbon tetrachloride or acetone to flocculate the particles into coarse aggregations, which are then separated.

U.S.P. 2,632,002 (24.6.50; 17.3.53). H. H. Gross, assr to Texaco Development Corpn. Countercurrent slurry process for effecting complex formation with urea or thiourea.

U.S.P. 2,632,778 (19.7.50; 24.3.53). F. L. Jonach, assr to Standard Oil Development Co. Hydrocarbon feedstock boiling from 115°–250° F, and containing only paraffins and naphthenes, is contacted at room temp with silica gel which has previously been contacted with ethylene glycol, the monomethyl ether of diethylene glycol, aniline, acetone, *iso*propyl alcohol, dimethoxytetraethylene glycol, or methoxytriglycol. The naphthenes are thereby separated. J. M. S.

U.S.P. 2,635,088 (16.1.51; 14.4.53). R. L. Holmes, assr to Raybestos-Manhattan Inc. The method of improving the physical properties of a polychloroprene composition, which comprises incorporating with polychloroprene from *ca* 1 to *ca* 50% by wt thereof of a pre-blended mixture of one part by wt of butadiene–acrylonitrile copolymer and from *ca* 1 to *ca* 2 parts by wt of cashew nut shell liq modified phenol-aldehyde resin. D. A. R.

Ger.P. 873,238, 26.2.53. E. Fischer, Essen. Process and installation for pptn from dil soln.
BrennstChemie, 1953, **34** (7–8). R. T.

Special Processes

2023. Petroleum supplements. L. C. Kemp and H. V. Atwell. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1436–40.—Reviews methods of obtaining fuel from sources other than crude oil. E J. C.

2024. New process for acrylonitrile. A. J. Weith. *Oil Gas J.*, 3.8.53, **52** (13), 78.—A new process is described that starts with natural gas to make acetylene and ammonia. The ammonia is reacted with more methane from natural gas to make hydrogen cyanide, which latter is reacted with acetylene to form acrylonitrile.

The process is to be used by the American Cyanamid Co at the Fortier Plant, Avondale, Los Angeles. G. A. C.

2025. New process for separation of isomeric hydrocarbons. P. W. Sherwood. *Erdöl u. Kohle*, 1953, **6**, 314–16.—Extractive crystallization is based on adduct formation between *n*-paraffins and urea and *iso*paraffins and thiourea. Urea adducts are exothermically formed by C_6–C_{50} *n*-alkanes, mol ratio of reactants is linear function of number of C atoms; *n*-olefins also form adducts, requiring slightly smaller proportion of urea. Adduct stability increases with length of paraffin chain, thiourea adducts are less stable than urea adducts. Adduct formation is activated by suitable solvent, *e.g.*, MeOH or aq low mol. wt. ketone. Pilot plant studies indicate practicability of production of *n*-paraffins of 95%, or higher, purity; urea loss is 0·2 kg/brl. V. B.

2026. Obtaining pure aromatic hydrocarbons from petroleum products. Y. Sousselier. *Rev. Inst. franç. Pétrole*, 1953, **8**, 290–301.—Bibliographical review of methods for extraction of nitration grade aromatics (purity 99·5% min) from pet fractions. Theoretical considerations limit choice of methods to 4; azeotropic dist, extractive dist, adsorption, and solvent extraction. Industrial processes are described, with flow diagrams, and suggested processes of these types also discussed; comparative table of main processes is given. Whilst actual choice depends on charge available, it is concluded that solvent extraction (diethylene glycol) is the most flexible and permits simultaneous recovery of the various aromatics (benzene, toluene, xylene). For highly aromatic (>80%) charge stocks azeotropic dist (using M.E.K.) is preferred, for low concns (10–20%) extractive dist (using phenol), whilst for very low concn (<5%) adsorption on silica gel is only practicable procedure. 20 refs. V. B.

2027. Patents. U.S.P. 2,635,105 (25.5.51 ; 14.4.53). H. M. Tanner, assr to Ethyl Corpn. The process of making a tetra-alkyl-lead compound comprising alkylating a non-porous alloy of sodium and lead.

U.S.P. 2,635,106 (25.10.51 ; 14.4.53). H. Shapiro and E. G. de Witt, assrs to Ethyl Corpn. A process for making tetra-ethyl-lead.

U.S.P. 2,635,114 (19.6.51 ; 14.4.53). M. J. Schlatter, assr to California Research Corpn. Polyalkylbenzene carboxylic acid and process of preparing it.

U.S.P. 2,635,116 (17.8.45 ; 14.4.53). J. K. Wolfe and K. L. Temple. A method of preparing an amine nitrite.

U.S.P. 2,635,119 (28.1.51 ; 14.4.53). H. de V. Finch and K. E. Furman, assrs to Shell Development Co. The process for converting an olefinic hydrocarbon containing an aliphatic chain of at least 3 carbon atoms, between 2 of which there exists aliphatic double bond, to a ketone having the same number of carbon atoms as the hydrocarbon.

U.S.P. 2,635,122 (8.11.50 ; 14.4.53). J. H. Dunn, C. M. Neher, and P. W. Trotter, assrs to Ethyl Corpn. The method of preparing 2-chloro-1 : 3-butadiene. D. A. R.

Ger.P. 873,083, 26.2.53. H. Kloepfer, assr to Deutsche Gold- und Silberscheideanstalt, formerly Roessler, Frankfurt (Main). Production of highly-dispersed oxides in aerosol form.

Ger.P. 872,787, 26.2.53. H.-W. Schmidt, assr to Kali-Chemie A.G., Hannover. Process for obtaining Al_2O_3.

Ger.P. 872,939, 26.2.53. W. Reppe, assr to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. " in dissolution "), Ludwigshafen (Rhein). Production of acrylic acid esters and their substitution products.

Ger.P. 872,940, 26.2.53. P. Kurtz, assr to Farbenfabriken Bayer, Leverkusen-Bayerwerk. Production of dihydromuconic acid dinitrole. (Addn. to Pat. 875,374.)

Ger.P. 872,941, 26.2.53. P. Kurtz and O. Bayer, assrs to Farbenfabriken Bayer, Leverkusen-Bayerwerk. Production of unsaturated nitriles.

BrennstChemie, 1953, **34** (7–8). R. T.

PRODUCTS

Chemistry and Physics

2028. Determination of grain form. F. Schulz. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (2), 49–51.—The procedures of Walz and Rothfuchs and Fickel—incorporated in standard specifications—for calculating grain shape of fillers for road construction, are shown to give only approx vals for grain form Z. A new val, K_s, varies from Z by addition of a supplementary expression, and the correction for magnitude l is expressed by : $K_s = Z + 2Z(l/b - 1)$; vals d and v are considered in Z. For the commonly occurring ratio $l/b = 1 : 0{\cdot}75$, the Z val changes by 66·4%. This expression is not universally applicable, since it depends not only on grain form but also on average grain size. Comparative vals are obtained if all grain form vals are referred to a normal size. The prism val b^3, determined through the average breadth, is proposed as a reference element for each grain step. Thus, the more general grain form val Ke is obtained, calc as % deviation from the best grain form val of the cube (b^3) : $Ke = b^3 \cdot K_s - 100$ (b in cm). Val Z of the stone is calc on vol $V = 100$ cm^3. Introducing V into the Ke expression, $Ke = \frac{100}{V} \cdot b^3 \cdot K_s - 100$. For the cube form $K_s = Z$ and for $V = 100$, $Ke = 0$, since $Z = 100/b^3$. Instead of 0 as starting point 100 may be taken, giving 100-fold vals. The simplified expression becomes : $Ke = \frac{100 \cdot b^3 \cdot K_s}{V}$. Applications are discussed. R. T.

2029. Reactions of hydrocarbons. Ionic mechanisms. L. Schmerling. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 1447–55.—Polymerziation of olefins, alkylation of *iso*paraffins and aromatic hydrocarbons, isomerization, and cat cracking are discussed by reference to mechanisms involving carbonium ions. Examples are given.

E. J. C.

2030. Variation in smoking tendency among hydrocarbons of low molecular weight. R. L. Schalla and G. E. McDonald. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1497–500.—Apparatus and procedure reported for investigating smoking tendencies of paraffins, *iso*paraffins, *cyclo*paraffins, unsaturated and aromatic hydrocarbons with up to 10 C atoms in the mol. Max rates at which these compounds could be burned without smoking was : *n*-paraffins > *iso*paraffins > mono-olefins > alkynes > aromatics. E. J. C.

2031. Compressibility chart for hydrogen and inert gases. F. D. Maslan and T. M. Littman. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1566–8.—Data given over the range of conditions up to 500° K and 1000 atm. E. J. C.

2032. Application of Benedict equation of state to propane. F. T. Selleck, J. P. Opfell, and B. H. Sage. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1350–4.—A group of 18 sets of coeff for the Benedict equation of state for propane was established. It was possible to obtain a standard error of estimate for the compressibility factor less than 0·003 up to 10,000 p.s.i. and between 100° and 460° F. E. J. C.

2033. Progress review No. 24. Fundamental aspects of combustion—some reactions of atomic hydrogen in flames. J. R. Arthur and D. T. A. Townend. *J. Inst. Fuel*, July 1953, **26** (150), 44.—Early experimental work on the properties of atomic hydrogen is reviewed. Aspects considered include : the hydrogen spectrum, methods of detection of hydrogen atoms, and the recombination of hydrogen atoms. The part played by the hydrogen atoms in the slow combustion of hydrogen and of carbon monoxide is discussed. Hinshelwood's work on hydrogen combustion is particularly noted. There are 2 possible mechanisms of carbon monoxide combustion, depending on whether water or other hydrogen-containing species are present. BCURA researches have shown that the bulk of the heat release in the burning of solid fuels depends critically on the presence of such elementary particles as H, OH, and H_2. The main technique described for the detection of atomic hydrogen in flames concerns the chemiluminescence observed when certain flames are brought into contact with promoted oxide surfaces. E. C. W. Smith's work relating to low-pressure hydrogen flames and to an examination of the effects of exposing activated oxides to a hydrogen discharge is considered in some detail, as is also an account of further experiments carried out in the BCURA laboratories. 22 refs. D. K.

2034. Combustion. F. T. McClure and W. S. Berl. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1415–25.—Discusses flame propagation in relation to heat conduction, diffusion, and chemical reaction. Flame structure and stability are also studied, particularly in respect to engines. E. J. C.

2035. Kinetics of vapour-phase oxidation of organic substances. M. Niclause and A. Combe. *Rev. Inst. franç. Pétrole*, 1953, **8**, 311–54.—Simple typical free radical chain mechanism is suggested to explain slow vapour-phase thermal oxidn of RH, leading to formation of a hydroperoxide RO_2H. Such kinetic scheme involves the two usually recognized chain propagation processes, viz., $R^{\cdot} + O_2 \rightarrow RO_2^{\cdot}$; $RO_2^{\cdot} + RH \rightarrow RO_2H + R^{\cdot}$. Chain initiation is assumed to arise simultaneously from two thermal processes which give rise to free radicals ; a bimolecular reaction between RH and O_2 and the slow monomolecular decomp of the hydroperoxide RO_2H. Proposed mechanism further supposes that chain rupture is essentially due to interaction between two chain carrier radicals. At a relative oxygen concn which is not unduly small the most plentiful chain carriers are the hydroperoxide radicals RO_2 ; chain rupture necessarily implies the mutual destruction of two such radicals. Main purpose of the present work is to determine in detail, for slow thermal vapour phase oxidn, the complex kinetic consequences of the suggested mechanism, so that the findings can be compared with experimental results. It is shown that at relatively large oxygen concn the speed of such autocatalytic reactions is largely independent of initial oxygen concn but highly dependent on concn of org substance. Theories put forward are discussed, and possible complications of the simple mechanism proposed are considered. (Authors' Summary.)

2036. Patents. Ger.P. 872,937, 26.2.53. S. Winter, Berlin-Wilmersdorf. Progress for intensifying mutual effect between flowing and stationary substances.

Ger.P. 872,943, 26.2.53. H. Arens, assr to T. Goldschmidt A.G., Essen. Production of aq soln of organosilicon compounds.
BrennstChemie, 1953, **34** (7–8). R. T.

Analysis and Testing

2037. Infra-red for process control. D. E. Berger. *Petrol. Process.*, 1953, **8** (6), 887–9.—The recent use of automatic infra-red analysers in the petroleum refining, petrochemical, and natural gas industries has helped to improve many processing operations in regard to both product and quality. A summary of the many applications of these sampling and analysing instruments is presented, and 2 typical systems used in Phillips Petroleum Co.'s plant are given. The methods of presentation of the analysis, such as circular and strip chart type potentiometer recorders, are also discussed. J. W. H.

2038. Composition of crude benzenes. H. Ritter. *BrennstChemie*, 1953, **34** (7–8), 113–18.—A thorough investigation of differences—chiefly after H_2SO_4 scrubbing—in the residues containing coumarone resins, from the Ruhr region, is presented. The individual fractions from a fine fractionation of crude benzol are identified by the n_D^{20}, as tabulated. Conventional methods are employed for the examination of the fractions. The results presented in curves are supported by complementary n_D^{20} curves. Observations indicate that the temp-sensitive constituents are cracked at high temp in the order aliphatics, higher and then lower homologues of benzene. Very small aliphatic cont alters the b.p. curve of a light oil appreciably. The toluene ratio is a good criterion for temp relations in a coke oven. R. T.

2039. Viscosity index: a proposed modification. K. K. Rumpf. *Erdöl u. Kohle*, 1953, **6**, 316–20.—Modified form of V.I. (" $V.I._{mod}$ ") is proposed which is based on the slope of the visc–temp curve (Walther's " m value "). Whilst any reference points may be used, those chosen have been selected so as to yield results similar in magnitude to the present V.I. system; main divergencies are for oils of very high V.I. (*e.g.*, V.I. 110 = $V.I._{mod}$ 125) and for low visc oils of medium and low V.I. (*e.g.*, at 8 cs/50° C V.I. 0 = $V.I._{mod}$ 50). For visc (cs) at 50° C: $V.I._{mod} = 50{\cdot}23\,(12{\cdot}49 \log(\nu_{50} + 0{\cdot}8) - 2{\cdot}5\,m)$ but $V.I._{mod}$ may also be derived from visc at 100° F or 210° F and, graphically, from diagram (given, for visc at 50° C) on which ordinate is m and the abscissa $\log(\nu + 0{\cdot}8)$. Tables are given showing relationship between V.I. and $V.I._{mod}$. V. B.

2040. Analysis of hydrocarbon-containing gas mixtures. W. Wustrow. *Erdöl u. Kohle*, 1953, **6**, 321–2.—Modification of Leuna column (developed *ca* 1937 for analysis of hydrogenation plant products) is described. Vacuum-jacketed reflux head dispenses with pentane as coolant and uses liq N_2 directly. Drawing and operational procedure of the new (Ruhrgas) column are given. H_2, CO, N_2, O_2, and CH_4 are uncondensed and determined on Orsat. Separation sharpness (operating pressure 30 mm) is checked by gas density of fractions. (Cf. Abs. 1602—1949.) V. B.

2041. Rheology of disperse systems. I. Theoretical treatment of the direct and absolute measurement of flow properties. K. H. Grodde. *Erdöl u. Kohle*, 1953, **6**, 380–5.—Typical rheological phenomena are briefly surveyed, and requirements for an universally applicable absolute rheometer are stipulated. Mathematical consideration of flow through tubes and through the annulus between co-axial cyl indicates that capillary and sinker type viscometers are not suitable as absolute rheometers. Only flow between rotating concentric cyl (Couette instrument) is, in the limiting case when the annulus is small compared with the cyl radii, suitable for direct measurement of the constants of the material under test. (Author's Summary.)

2042. Hard asphalt determination. Anon. *Erdöl u. Kohle*, 1953, **6**, 401.—Draft German standard (DIN 51557). Applicable to non-additive mineral oils. 5 g oil dissolved in 40 vols " normalbenzin " (d_4^{15} 0·695–0·705, b.p. 65°–95° C, aromatics 2% max), stood in dark at 17°–23° C for 16 hr, filtered, extracted with normalbenzin followed by EtOH; finally extracted with C_6H_6, solvent evaporated, weighed. V. B.

Crude Oil

2043. Relationship of hydrocarbons with six to nine carbon atoms. H. M. Smith and H. T. Hall. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1491–7.—Data reported on percentage of individual and classes of hydrocarbons present in naphthas from 32 crudes. E. J. C.

2044. What is petroleum? J. B. Hill. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1398–401.—Author reviews position regarding present knowledge of composition of petroleum, and points out the large deficiencies, particularly in relation to nitrogen, sulphur, and oxygen compounds present in the various fractions. E. J. C.

2045. Study of some Middle East crudes. II. Iraq crude. Anon. *Rev. Inst. franç. Pétrole*, 1953, **8**, 380–7.—(Cf. Abs. 1773—1953.) Results of pilot plant evaluation. Crude (d_4^{15} 0·844, S 1·7%, wax 2·0%, asphaltenes 2·1%) atm and vac fractionated into 80 1% cuts, tests on which are given. Yields are (wt %): gas 1·6, gasoline (205° C) 30·2 (O.N. Motor 38 clear, +0·05% T.E.L. 58), kerosine (200°–240°) 4·7, gas oil (240°–345°) 22·1 (cetane 52). V. B.

Gas

2046. Natural gas to ethane to ethylene. D. J. Stark. *Petrol. Process.*, 1953, **8** (6), 897–9.—With the consumption of ethylene at a high figure due to an increase in the production of ethylene glycol and synthetic ethanol, the National Petro-Chemicals Corpn have located a natural gas pipeline at Tuscola, Illinois, U.S.A., as a source of ethane or propane for cracking to ethylene. Over 400 million cu.ft/day of gas is processed, and from this 10 million cu.ft/day of ethane is produced for cracking to ethylene.

The ethane is cracked at a high temp and low pressure to ethylene and hydrogen, separation being accomplished by fractionation and low temp separation. Extraction of hydrocarbons from the natural gas is also carried out. The extraction unit consists of a light and heavy oil absorption system with a de-methanizer operating at 405 p.s.i. to provide methane removal facilities.

Details are given of the utility requirements and products recovery at this new natural gas plant which came into operation July 1953. J. W. H.

2047. Equilibrium in the steam reforming of natural gas. H. A. Dirksen and C. H. Riesz. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1562–5.—Mathematical method for calculating quickly equilibrium compositions in steam reforming of natural gas. E. J. C.

Engine Fuels

2048. Mechanism of combustion chamber deposit formation with leaded fuels. W. E. Newby and L. F. Dumont. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1336–42.—The inorganic lead salt portion of chamber deposits was studied by thermodynamic calculations and experiments. Main reactions appear to be due to solid lead oxide, which condenses on walls, and subsequent combination with acidic constituents of hot gases, the course of the reactions being controlled by the deposit temp. E. J. C.

2049. Petroleum fuels. W. G. Lovell. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1426–9.—General considerations of fuels used for spark ignition, compression ignition, and jet engines. E. J. C.

2050. Engine testing of fuels. H. Reichel. *Erdöl u. Kohle*, 1953, **6**, 293–4.—Fuel requirements of spark-ignition and C.I. engines are outlined, and test methods briefly described. Comparative scale showing O.N. against cetane number is given. V. B.

2051. Will the increasing use of boiler oil for motor ships influence its price and availability? Anon. *Mot. Ship*, July 1953, **34** (400), 134.—It is estimated that by the middle of 1956 there will probably be about 1200 ocean-going motor ships in service with machinery operating on boiler oil, with a total output of 5,500,000 b.h.p. and a total fuel consumption of about 4,700,000 tons. In 1951 the world residual output was 177 million tons; it is predicted that in 1956 it will be 200 million tons, and the demand of 4,700,000

tons estimated to be the requirements for boiler oil in motor ships will, therefore, scarcely affect the world position. U. M.

2052. Methods for measuring combustion efficiency in gas turbines. J. Fellous. *Rev. Inst. franç. Pétrole*, 1953, **8**, 277–81.—Theoretical temp at end of complete combustion is given by thermal balance equation; if actual temp is known, then combustion efficiency can be calculated. Measurement of this temp is difficult. Best procedure is to plot temp distribution map of issuing gases from readings of several thermocouples. From this temp combustion efficiency can be calculated, 3 methods being given. Combustion efficiency can also be calculated from composition of issuing gas, for high efficiencies CO_2 content is sufficient, but for efficiencies <80–85% a knowledge of CO content is also necessary. V. B.

2053. Fuels for aviation gas turbines. P. Giuliani. *Rev. Inst. franç. Pétrole*, 1953, **8**, 282–9.—U.S.A., British, and French specs are tabulated, and relationship between properties and conditions of use discussed. Aniline gravity product (an. pt. (° F) × API) is suitable substitute for more tedious cal. val. determination. Recent tendency is to use heavier fuels (*e.g.*, U.S., J.P.5). 28 refs. V. B.

Gas Oil and Fuel Oil

2054. A paper-strip method for examining fuel oils suspected of being identical. M. Herd. *Analyst*, 1953, **78**, 383–4.—The method has been developed to compare fuel oil samples collected from the surface of navigable waters with samples of the fuel oil from the tanks of ships suspected of having made illegal discharge.

The method which gives visual evidence of complete identity or non-identity is carried out by preparing paper-strip chromatograms under identical conditions and comparison of same under U.V. light. A. G. M.

2055. Patents. U.S.P. 2,630,165 (11.1.49; 3.3.53). M. Resek, assr to Perfection Stove Co. Liq fuel burner.

U.S.P. 2,630,156 (24.12.47; 3.3.53). L. C. McKee. Hearth-type oil burner with flame rim ignition means.

U.S.P. 2,630,167 (27.10.50; 3.3.53). E. J. Diehl, assr to Farspan Industries Inc. Ignition and control system for liq fuel burners having an electrical heating element for gasifying fuel.

U.S.P. 2,630,168 (25.10.50; 3.3.53). J. E. Farrell, assr to Farspan Industries Inc. Gasified fuel oil burner.

U.S.P. 2,631,656 (11.10.48; 17.3.53). R. H. Siemon. Combination gas and oil burner and control system therefor.

U.S.P. 2,631,657 (2.9.50; 17.3.53). H. F. Tapp and R. M. Cochrane, assrs to Gilbert and Barker Manufacturing Co. Ignition means for gun-type oil burners.

U.S.P. 2,631,892 (21.2.50; 17.3.53). W. V. Czarnecki and C. M. Czarnecki, assrs to Eddington Metal Specialty Co. Oil burner filter.

U.S.P. 2,631,929 (G.B. 21.10.48; 17.3.53). T. C. G. Thorpe and E. M. Dodds, assrs to Standard Oil Development Co. Vanadium-containing heavy fuel oils containing 0·5% of carbon tetrachloride, ethylene dichloride, chloroform, or hexachlorethane.

U.S.P. 2,632,499–500 (16.1.48; 4.10.50; 24.3.53). D. L. Gatz and R. O. Hedges, assrs to Steel Products Engineering Co. Flow stabilizing devices for gun-type oil burners.

U.S.P. 2,632,501 (6.10.49; 24.3.53). E. R. Clark, assr to Peabody Engineering Corpn. Liq fuel burner.

U.S.P. 2,632,696 (28.8.50; 24.3.53). H. G. Smith, T. L. Cantrell, and J. G. Peters, assrs to Gulf Oil Corpn. Fuel oil stabilized against sludge formation.

U.S.P. 2,633,332 (8.11.46; 31.3.53). J. J. Murphy, J. M. Gaines, and E. L. McCandless, assrs to Union Carbide and Carbon Corpn. Liq hydrocarbon fuel containing 5 to 50% wt of calcium carbide is used for the flame working of rock. J. M. S.

Lubricants

2056. The determination of zinc in lubricating oils by amperometric titration. D. Pickles and C. C. Washbrook. *Analyst*, 1953, **78**, 304–13.—An amperometric method is described in which disodium ethylenediamine tetra-acetate (versene) is used at the dropping mercury electrode in strongly alkaline soln containing *cyclo*hexylamine or in a buffered soln containing ammonium acetate. Advantages include rapid attainment of equilibrium and prevention of the formation of bulky precipitates around the electrode system.

The method applies to both new and used lub oils, and methods of dealing with interfering elements are discussed.

A precision better than 2% is claimed. A. G. M.

2057. Determination of neutralization and saponification values of used lubricants. C. C. Washbrook. *Analyst*, 1953, **78**, 254.—A short critical review comparing methods currently used for the determination of neutralization and saponification values. A. G. M.

2058. Combustion chamber deposits. J. D. Bartleson and E. C. Hughes. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1501–8.—A study was made of the effect of motor oil composition on deposit formation in engines, using a bench test and a Chevrolet engine. Oils having low thermal decomposition temp or substantially greater volatility than conventional motor oil gave less deposits and less octane requirement increase. Cracked fuels obscured octane-requirement increase variations among petroleum oils. Blends containing non-volatile stocks gave more deposits than similar blends made using V.I. improvers. Oil improvers and antioxidants can be employed to reduce deposits attributable to engine oil. E. J. C.

2059. Present problems and future trends in lubrication. W. A. Zisman. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1406–14.—Reviews recent progress and unsolved problems relating to friction and wear prevention.

Mol structure required in a synthetic oil is then considered, followed by synthetic oils which have been used for lubricants. Antioxidants, rust inhibitors, detergents, and greases are also dealt with. 126 refs. E. J. C.

2060. Lubricant consumption calculation. P. Beuerlein and N. Kuckhoff. *Erdöl u. Kohle*, 1953, **6**, 325–8.—Comparison of lub consumption data would be facilitated by standard reporting procedure. This is object of draft German spec DIN 51 500 (reproduced), which gives basic units for expressing lub consumption of large variety of machines, etc. Detailed example is explained in case of units for cyl lubrication of a piston machine (g oil per 1000 sq. m. of operating surface). V. B.

Bitumen, Asphalt, and Tar

2061. Studies of the hardening properties of asphaltic materials. J. T. Pauls and J. Y. Welborn. *Public Rds, Wash.*, 1953, **27** (9), 187.—Experimental work by the authors leads to the following conclusions: (1) Bitumens of different crude origin have different hardening properties. (2) Hardening properties depend upon method of manufacture. (3) Cracked bitumens become hard and brittle more rapidly than distilled bitumens; on weathering, they also develop a higher degree of hardness and brittleness, the rate of hardness increasing with the degree of cracking. (4) Increase in hardness, measured by decrease in penetration, is accompanied by increase in S.P. and decrease in ductility and solubility.

During the course of the work 2 new methods, the abrasion test and the weathering strength test, were developed, involving the measurement of the change in physical properties on exposure to heat and the atmosphere, of standard sand–asphalt mixtures. The thin-film oven test was found to be a more speedy and simpler test of measuring these hardening properties. R. H.

2062. Use of emulsified asphalt in base course materials. D. E. Stevens. *Rds & Str.*, 1953, **96** (6), 100.—The 2 primary aspects of the use of bitumen emulsion in the treatment of base course materials of interest to paving technologists are the ability of the

bitumen to provide cohesion and to slow down the rate of transfer of moisture in a system of which it is part. The author analyses the types of materials and the conditions satisfactorily covered by these properties. Sandy materials are the most satisfactory, but borderline pit-run aggregates are now being treated satisfactorily in America. Details of the use of bitumen emulsions with cohesive soils are given. The process of stabilization and the role played by the bitumen emulsion are discussed in detail; difficulties with certain types of soils which have a very strong affinity for water are enumerated. Finally, considered replies are given to the most frequent questions on merits and demerits of different types of base course treatment. R. H.

2063. Latest bitumen research development. T. Temme. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (5), 125–8.—A brief review of changes in industrial production of bitumen for various applications. An abstract of the research report on bitumen by E. C. Hughes and H. F. Hardman, published in the *Research Reports of Petroleum Technics*, 1951, of the *Amer. Chem. Soc., Washington*, is included. R. T.

2064. Properties of road tars with bitumen addition. H.-G. Franck and O. Wegener. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (5), 120–4.—Bitumen-free tars are used; the bitumen cont must be $\geqslant 15\%$ to avoid impairing the adhesiveness. Only bitumen miscible with road tar without separation of oil in emulsion or drop form may be used. Initial visc, setting rate, and behaviour of the soft pitch residue after vaporization of light oils on the roads are important. Setting rate of road tars is dependent on initial visc and pitch : anthracene oil ratio. Bitumen-tars from pure road tars with a pitch : anthracene oil ratio 3·5 : 1 set *ca* 30% quicker, due to the pitch : anthracene oil ratio, than the corresponding pure road tars of the same visc. Visc increase during setting is calc from the vaporization loss by the formula:

$$(\log V_1 = \frac{G}{5{\cdot}3} + \log V),$$

which is approx valid also for road tars. Setting rate of bitumen-tars is a function of visc and soft. pt. of the dist residue. For a known history of the tar the setting rate is given directly from these two vals, saving experimental determination. Choice of visc and setting rate determines the composition of a bitumen-tar. Charts are included. R. T.

2065. Production of roofing compositions. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (5), 129–33.—Pt III discusses the steeping of roofing paper by the single bath, 2 bath, and continuous processes. Diagrams, with explanatory legends, of German and American plants are given. Photographs include a plant for pre-steeping with tar oil. R. T.

2066. Patents. U.S.P. 2,636,834 (15.2.50; 28.4.53). D. N. Myers, assr to Byerlyte Corpn. Application of a uniform mixture of fluent asphalt of penetration 20–120 and inert mineral particles, with higher specific gravities than the fluent asphalt, as deadener layers on metal surfaces and the like.* D. A. R.

Special Hydrocarbon Products

2067. Patents. Ger.P. 838,746, 26.2.53. W. Berndt, assr to Farbwerke Hoechst, formerly Meister Lucius & Brüning, Frankfurt (Main)-Hoechst. Production of 2-ethylhexanal-(1) or 2-ethylhexanol (1).

Ger.P. 845,193, 26.2.53. W. Berndt, assr to Farbwerke Hoechst, formerly Meister Lucius & Brüning, Frankfurt (Main)-Hoechst. Production of 2-ethylhexanal-(1) or 2-ethylhexanol-(1).

Ger.P. 848,944, 26.2.53. W. Berndt, assr to Farbwerke Hoechst, formerly Meister Lucius & Brüning, Frankfurt (Main)-Hoechst. Production of 2-ethylhexanal-(1) or 2-ethylhexanol-(1).

Ger.P. 873,084, 26.2.53. P. Schlack, assr to Bad. Anilin- & Soda-Fabr. (I.G. Farbenindustrie A.G. "in dissolution"), Ludwigshafen (Rhein). Production of multiple reactive carbamic acid derivatives.

Ger.P. 873,087, 26.2.53. H. Henecka, assr to Farbenfabriken Bayer, Leverkusen-Bayerwerk. Production of easily-sol halogenpyridine compounds.
BrennstChemie, 1953, **34** (7–8). R. T.

Derived Chemical Products

2068. Styrene. Pt 2. P. W. Sherwood. *Petrol. Process.*, 1953, **8** (6), 902–6.—Further steps in the production of styrene from ethyl benzene are presented, and the method used in the purification of this important organic chemical is described.

The principal variables in the cat dehydrogenation of the ethyl benzene are: the choice of cat, partial pressure of product, operating temp, contact time, and conversion per pass. Each one of these variables is considered in detail and their interrelation reviewed.

The commercial version of the dehydrogenation process is outlined, and performance figures are given, together with the composition of the liq make to the reactor.
J. W. H.

2069. Designed to operate at 20° F below zero. G. S. Williamson. *Petrol. Process.*, 1953, **8** (6), 900–1.—Canada's new petrochemical plant near Montreal has all its process equipment, except a Petrochem furnace and the tops of fractionators, enclosed in buildings, with the result that it can operate in sub-zero temps. The plant produces *iso*propyl alcohol by hydrolysing the ester of a propylene–propane mixture, and consequent steam stripping and distn to give a pure product. Acetone is also produced by catalytically dehydrogenating some of the *iso*propyl alcohol in the Petrochem furnace.

Many problems present themselves because of the low weather temp. These include sulphuric acid storage and cooling tower operation. The ventilation and heating systems in the 65 ft wide and 140 ft long process building are an interesting feature of the plant and are discussed at length. J. W. H.

2070. Textiles from petroleum. P. W. Sherwood. *Industr. Chem. Mfr*, 1953, **29**, 351–4.—Production of main raw materials from pet is reviewed. C_2H_4, 80% theoretical yield by thermal cracking C_2H_6, separated by low temp dist; C_2H_2, 31% theoretical yield by oxidn of CH_4, although CaC_2 is still main source; HCN, by cat (Pt) reaction of NH_3, O_2, and CH_4. Ethylene oxide is increasingly made by direct oxidn (Ag cat) of C_2H_4. Vinyl chloride is obtained by dehydrohalogenation (kaolin cat) of dichloroethane obtained by direct chlorination of C_2H_4, or, more frequently, by $C_2H_2 + HCl$ ($HgCl_2$ cat). Acrylonitrile is yielded by direct cat ($NH_4Cl + Cu_2Cl_2$) reaction of C_2H_2 and NH_3, whilst terephthalic acid is obtained by oxidn of *p*-xylene. U.S. production of synthetic textiles estimated at 487 million lb in 1953, approx doubling by 1960.
V. B.

2071. Patents. U.S.P. 2,635,120 (29.3.50; 14.4.53). R. M. Alm, assr to Standard Oil Co. Obtaining purified phenols and cresols of petroleum origin. D. A. R.

Ger.P. 873,239, 26.2.53. K. Broderson and M. Quaedvlieg, assrs to Farbenfabriken Bayer, Leverkusen-Bayerwerk. Production of sulphonic acids or sulphonates of high-mol paraffin hydrocarbons.

Ger.P. 872,944, 26.2.53. A. Dornow and A. Frese, Hannover. Production of primary amines from ketoximes.
BrennstChemie, 1953, **34** (7–8). R. T.

Coal, Shale, and Peat

2072. Experiments to produce low-sulphur metallurgical coke. W. Fuchs and G. Wunderlich. *BrennstChemie*, 1953, **34** (7–8), 108–13.—Laboratory experiments on desulphurization of cokes from 2 coals, by varying the coking chamber temp, and by reductive and oxidative treatment, are described. The apparatus is illustrated and the results tabulated. Coking in ammonia is satisfactory but uneconomical. Coking in coke-oven gas is feasible if a weak stream of purified gas can be fed in industrially as in the laboratory. Oxidative aftertreatment with air or air–steam has an appreciable desulphurizing effect. Air treatment is more economical for obtaining max effect without igniting the coke. R. T.

2073. Separability of phenols by distillation, with special reference to phenols from coal and brown-coal. I. Vapour pressures and other physical data on phenols. H. Stage, E. Müller, and P. Faldix. *Erdöl u. Kohle*, 1953, **6**, 375–80.—Critical compilation from literature (refs given) of mol. wt., m.p., b.p., temp for various v.p. (in range 1–1000 mm), n_4 and d_4 (for various temp), spec.ht, lat.ht.vap., visc, surface tension. Data cover 76 phenols. V. B.

2074. Purification of grid gas by expansion cooling. P. Holthaus. *Erdöl u. Kohle*, 1953, **6**, 260–5.—Main impurities to be removed from coke-oven gas intended for long distance transmission are H_2O vapour and naphthalene, desired level is dew point of 5° C and naphthalene content of 5 g/100 cu.m/atm. Theory of process is considered, and operating results given of installation of 6000 cu.m/hr capacity. Total capacity of planned and erected installations of this type is 68,000 cu.m/hr. V. B.

2075. Underground gasification. J. Pilar. *BrennstChemie*, 1953, **34** (7–8), 118–22.—The theory and purpose of underground gasification of all types of coal and oil shale are discussed with explanatory drawings. Belgian, French, English, and American procedures are appended. R. T.

2076. Dispersions of molybdenum disulphide. Anon. *Mech. World*, July 1953, **133** (3408), 309.—A number of dispersions of colloidal molybdenum disulphide are now marketed. These dispersions are stated to be more mobile, more convenient to handle and more easily blended with additional quantities of the liq carrier. They are considered to offer advantages over conventional lubricants in certain metal working and cutting operations, and as a means of preventing frettage corrosion. T. T.

Corrosion

2077. War against corrosion—preventing hydrogen attack on steel. Pt 2. W. A. Bonner, H. D. Burnham, J. J. Conradi, and T. Skei. *Petrol. Process.*, 1953, **8** (6), 878–83.—A practical method of preventing hydrogen blistering associated with aq corrosion of equipment in refinery processing streams has been developed by Shell Oil Co. Laboratory experiments have shown that the addition of a polysulphide in acid soln is ineffective for the prevention of hydrogen penetration, and so the process gas stream is first neutralized with ammonia, and then air is injected under controlled conditions to produce the polysulphide in alkaline soln. In this case the polysulphide has been found to be effective in reducing or eliminating corrosion and hydrogen penetration.

The effect of adding the polysulphide is not instantaneous, but is obtained in a short period of time. The polysulphide is either adsorbed off the iron surface and prevents corrosion, or reacts with previously formed ferrous sulphide to give a reaction product which impedes hydrogen penetration.

Details of the oxygen injection and plant installation to control hydrogen penetration are given with a flow diagram of the plant equipment in which the tests were carried out. J. W. H.

2078. Ultrasonic inspection for internal pipeline corrosion. S. K. Gally. *Oil Gas J.*, 3.8.53, **52** (13), 61.—Field tests show that ultrasonic equipment can provide practical and accurate means for locating and measuring corroded areas inside a pipeline. Defects in the pipe wall can also be discovered, pits detected, and their depths measured. Procedures for rapid scanning and handling scanning data have still to be developed. G. A. C.

Engines and Automotive Equipment

2079. Second International Internal Combustion Engine Congress. *Gas Oil Pwr*, 1953, **48**, 117–29.—A summary of the work of the Congress held in Milan, 13–19 Apr. 1953. The papers listed below are summarized, and a report is given of the discussion following their presentation.

Residual fuel production and utilization in diesel engines, by C. E. Habermann, R. E. Albright, and R. B. Killingsworth. Deals with the refinery operations employed to

convert crude oil into the various petroleum products. The residue after thermal coking, cat cracking, and reforming may be only 3%, compared with 40% from straight dist. The effect of pressure on visc and the removal of sodium and vanadium salts are discussed.

British experiences on Supplement 1 and other highly additive treated oils, by A. Towle. Deals with the use of these oils in large low-speed engines running on heavy fuels, where the main problem is one of cyl, ring groove, and ring wear due to the high ash content of the fuel. Particular reference is made to crosshead engines.

Points discussed in this group were: piston crown deposits, contamination of additive oils by water, and purification of additive oils by centrifuging.

The following 4 papers treat the problems of deposition, wear, etc., in engines operating on heavy fuels:

Tests on the use of heavy fuels in Tosci four-stroke exhaust gas supercharged diesel engines, by — Casci and — Scirocco.

Wear of cylinder liners in diesel engines of medium and large bore with special reference to running on heavy fuels, by — Simonetti.

Two and four cycle tests results of medium speed engines on heavy fuels, by J. M. A. van der Horst.

Turbo supercharging of large two-cycle diesel engines and their operation on heavy fuel oil, by — Carletti.

The economics of operation with heavy fuels was discussed in the following papers:

Technical and economic considerations concerning the use of boiler fuels in diesel engines, by E. Cotti. States that: (*a*) operation is not more difficult; (*b*) consumption is 8–9% more than with diesel fuel; (*c*) maintenance is increased by a factor of 50–70%; (*d*) compared with diesel fuel in an engine running for 6000 hr/year, no economy is obtained for the first 200 hr, thereafter the economy is proportional to running time.

Boundary zone of economical employment of heavy fuels in diesel marine engines, by M. A. F. Barcala. Theoretical costing based on the preceding paper is applied to 2 vessels. The theoretical gains are 220,000 and 376,000 pesetas; the actual figures are: loss 24,600 and gain 143,000 pesetas respectively.

Some experiences with the use of boiler fuel in different types of two-stroke engines, by D. T. Ruys. For successful use it is essential: (*a*) that products of combustion should not be allowed to contaminate the crankcase oil, and (*b*) to stellite the valves of uniflow scavenging engines.

The following papers discuss mainly the testing of heavy fuel under service conditions:

Test results of diesels for ship auxiliaries of average power running on boiler fuel, by L. Varriale. It is concluded that an Ansaldo Q engine (200 b.h.p. at 360 r.p.m.) can burn efficiently fuels up to 3000 sec Red I (100° F) without substantial modification.

Tests with Stork Hesselman two-stroke engines running on heavy fuel, by G. Wieberdink and A. Hootsen. Tests carried out on a double-acting 2-stroke engine with cyl of 720 mm bore and 1200 mm stroke with fuel of 1500 sec Red I (100° F) and with a single cyl (540 mm bore and 900 mm stroke) test engine with fuel of 3500 sec show that no major modifications are necessary on these engines.

Limitations of boiler fuel for diesels as indicated by service and research experience, by G. M. Christie and C. L. Bailey. On marine propulsion engines and medium-speed engines it is found that: (*a*) increase in abrasive wear is due to the ash content of the fuel; (*b*) exhaust valve guttering, due to the valve seat being coated with molten Na_2SO_4, which later disintegrates in patches, is increased; (*c*) injector nozzle holes should be increased in number or size; (*d*) on the largest engines oil cooling of the pistons has a beneficial effect on the piston ring conditions.

Operating experience of Doxford engines on high viscosity fuel oils, by P. Jackson. The fuel should not exceed 1500 sec Red I (100° F), and the sum of Conradson C value + %S should be $<12\%$. With large engines combustion was smoother than when diesel fuel was used, and there was no knock. Pilot injection was not necessary. The

average rate of cyl liner wear was 2–3 times that when using diesel fuel, and piston ring wear was also greater.

Technique of heavy oil operation, by F. Schmidt. A 5-cyl single-acting 2-stroke marine engine of 3300 b.h.p. at 125 r.p.m., with cyl of 700 mm bore and 1200 mm stroke, was run first on gas oil and then on heavy fuel at equal adjustment. For efficient operation 7 constructional modifications are recommended.

Some results of the heavy oil operation of four-stroke trunk-piston engines of medium size, by K. Zinner. For running on heavy fuels in engines of the class considered, 5 disadvantages are listed, and a list is given of the difficulties experienced in practice, together with the remedies adopted. It is concluded that, if the heaviest grades of fuel are not used, good results can be obtained with engines having cyl as small as 220 mm bore, provided that they are suitably modified.

Application of heavy fuel oils to fast-running geared marine diesel engines, by W. Brose. Discusses measures recommended for improving the running of diesels on heavy fuels.

Two years experience on heavy fuel in a ship propelled by three diesel engines of the Sulzer two-stroke double-acting type, by W. Sozonoff and P. Pluys. With these engines the following modifications were necessary : (*a*) a spark arrester was fitted ; (*b*) the injectors were heated before starting and cooled when running ; (*c*) nozzle hole dia were reduced ; (*d*) piston rod stuffing boxes needed careful maintenance ; (*e*) the clearances of injector needles, fuel pump plungers, etc., were increased.

Some notes and results relating to the use of heavy fuel oils in marine diesel engines, by M. H. Andresen. Greater deposits will cause more frequent maintenance, but this may be reduced by better cyl lubrication. Crosshead engines should be superior to trunk-piston engines. Data are given on fuel consumption and cyl liner and piston ring wear.

Is the use of heavy oil fuel in engines of inland navigation vessels a cause for frequent and systematic breakdowns? by J. Messiez-Poche. Different engines of 50–500 b.h.p. are run on a mixture of gas oil and liq fuel with visc 2° E (20° C) without preheating. A list is given of the parts most liable to failure, and the causes of failure. No wear figures are given.

In the ensuing discussion the following points were raised : (1) the necessity of altering the fuel injection equipment to give a definite spray pattern ; (2) the relation between % S of fuel and sludge formation ; (3) pretreatment of fuel by centrifuging ; (4) engine design is more important than fuel quality in that (*a*) clean combustion is necessary, (*b*) injectors must be cooled, (*c*) fuel injection systems must be efficient. Cyl lubrication is of prime importance, and in this respect detergent oils are good.

H. C. E.

2080. Second International Internal Combustion Engine Congress. Anon. *Gas Oil Pwr*, 1953, **48**, 137–9.—Essentially a summary by R. de Pieri of some of the papers read at the Congress.

For large 2-stroke engines ($\geqslant$3000 h.p.) it is easy to use bunker oil as fuel, provided that the fuel is preheated and the fuel valves are cooled. Specific fuel consumption is about the same as for gas oil. Troubles which may be experienced are (1) increased rate of liner wear (0·2–0·8 mm/1000 hr running) ; (2) possible poor performance of piston rings ; (3) possible erosion and corrosion on exhaust valve seats and stems ; (4) possible formation of deposits on scavenging and exhaust ports ; (5) more frequent maintenance. The necessity of using detergent oils for cyl lubrication has not yet been proved.

For medium sized 4-stroke engines (cyl bore 250–450 mm) bench tests show that for satisfactory performance on bunker fuels : (1) injection equipment and combustion chambers must be specially designed ; (2) detergent lub oils must be used, and piston must be kept cooled ; (3) valve seats must be protected ; (4) liner wear is prop to the ash content of the fuel, and wear is minimized with detergent oils. H. C. E.

2081. Design and development of a production gas turbine. Anon. *Gas Oil Pwr*, 1953, **48**, 140–4.—Following a description of the research carried out by Ruston, details of the Mark TA batch production gas turbine are given.

Research was conducted on the ducting and blades, and on the elbow combustion chamber. Here the bend, between compressor unit and turbine unit, which produces turbulence and pressure loss has been utilized to assist combustion by taking off air at this point for primary combustion. Work has also been done on the combustion of boiler fuels and of gases, including methane. The production units are based on experience with a prototype 750 kW gas-turbine which has now completed 3000 hr running.

The Mark TA model is rated at 750 kW with heat exchanger, or 1000 kW in its non-recuperative form, and is intended for power generation, oil pumping, etc. It comprises 2 self-contained units, the gas generator consisting of a 13-stage axial-flow compressor and associated turbine, and the power turbine with gearbox.

The control unit, fully automatic if required, brings the engine up to running speed, which is thereafter controlled by the turbine governor. The turbine set can be run on fuels ranging from natural gas to coal tar, and the controls can readily be altered to handle this variety of fuels. Auxiliary electrically-operated pumps for fuel and lub oil are required for starting, and various safety devices are fitted to ensure that the oil pressure is correct. H. C. E.

2082. Cleaning of engine air. III. Oil bath air cleaners. J. L. Koffman. *Gas Oil Pwr*, 1953, **48**, 150–3.—Previous articles discuss mechanical methods of cleaning air before entry into I.C. engines; this article describes types of oil bath cleaners.

The design and testing of a unit passing 190 cu.ft.air/min is described. Precautions had to be taken to obviate sucking of oil into the engine, and the final version contained an oil damper made from 2 layers of perforated Al sheets. In a severe cycling test using air containing 40 mg dust/cu.ft. the cleaner began to fail after 10 hr. With air flows of 380 cu.ft/min pressure losses are higher than at lower rates because of the relatively smaller passages in the housing. The position of the cleaner is important from the viewpoint of both servicing and efficiency. H. C. E.

2083. Corrosion of fuel injection nozzles. W. P. Mansfield. *Gas Oil Pwr*, 1953, **48**, 147–9, 153.—It had been found that a certain type of nozzle, after a short period of use, lost metal to such an extent that fuel was discharged through the side wall. This might be due to: (1) corrosion by SO_3 in the exhaust gases coupled with overcooling of the nozzles; (2) metallurgical defects; (3) electrolytic attack between the Cu washer and the steel nozzle. (4) gas erosion caused by excessive swirl or abrasion by carbon particles.

That explanation (1) was correct was proved by using an engine known to give trouble, and drilling the cyl head to circulate cold water round the nozzle seat. In this condition the nozzle showed characteristic attack after 9 hr running, and after 20 hr a groove 0·36 mm deep, or 18% of the wall thickness, had been formed. H. C. E.

2084. The chrome-hardening of cylinder liners. Anon. *Mot. Ship*, July 1953, **34** (400), 151.—A description is given of the method used by Messrs Van der Horst, of Hilversum, for the chrome-hardening of cyl-liners. It is claimed that cyl-liners treated by this process suffer no more wear in an engine running on boiler fuel than do normal cast-iron liners in an engine running on diesel fuel, and the wear rate remains lower than that normally encountered even when the chrome-plating is worn through. It is also contended that with this process there is complete bonding between the chrome layer and the metal, so eliminating the possibility of flaking. U. M.

2085. A 9600-b.h.p. Werkspoor-Lugt engine. Anon. *Mot. Ship*, July 1953, **34** (400), 142.—This class of engine was previously described in the Jan. 1953 issue of *Mot. Ship*. (Cf. Abs. 906—1953). The 9600-b.h.p. engine, however, has 12 cyl, of bore 680 mm and stroke 1250 mm, and is to run on boiler fuel. Of same basic design as the 4-cyl unit, this latest unit has been slightly modified, and has a mechanical efficiency of 88%. U. M.

2086. Liner wear in the M.T. "Auricula." Anon. *Mot. Ship*, July 1953, **34** (400), 145.—Comparative wear rates for cyl of the main engine of *Auricula* are presented. The engine, an 8-cyl, supercharged, 4-stroke, 4120-i.h.p., single-acting Werkspoor unit, has been operating since 1946 on boiler fuel, and was examined in April of this year. U. M.

2087. A highly supercharged opposed-piston engine. Anon. *Mot. Ship*, July 1953, **34** (400), 138.—This new design of Götaverken high-speed, 2-stroke unit is designed primarily for fast naval vessels, but with slight modification could have a commercial application. The unit has 10 cyl, each with a bore of 180 mm and stroke of 230 mm. Max output is 3000 s.h.p. at 975 r.p.m., while normal output is 2300 s.h.p. at 920 r.p.m. At max rating the piston speed is 1472 ft/min and the mean effective pressure 168·3 lb/sq.in. U. M.

2088. Armstrong Siddeley's Viper. Anon. *Aeroplane*, 31.7.53, **85** (2193), 139.—A full description with illustrations is given of the ASV.3 Viper Mark 100; it is a short-life, expendable engine, officially only required to run for 10 hr, and intended to power the Australian Jindivik pilotless target aircraft. The engine consists of an axial compressor, an annular combustion chamber, and an axial-flow turbine; its max sea-level static thrust is 1640 lb at 13,400 r.p.m., and it specific consumption is 1·09 lb/lb/hr. The engine is equally suitable for use with kerosine or wide-cut fuel. U. M.

2089. Diesel engine exhaust—developments for accurate evaluation of appearance. A. L. Wachal. *Auto. Engr*, July 1953, **43** (568), 303.—Common methods of diesel engine exhaust rating are surveyed. The method whereby smoke density is determined by the collection of solid particles in the exhaust is stated to be accurate and widely applicable, but has limited application in the field owing to difficulties associated with filtration, measurement of volume of hot engine exhaust, and accurate determinations of relatively small quantities of deposit. Existing designs of full-flow and sampling types of photo-electric smokemeters are described, and their inherent disadvantages are discussed. A new design of sampling type photo-electric instrument has been developed to alleviate disadvantages of former types. Separate tubes are provided for the exhaust gas and the air, and the photo-electric cell and light source are mounted so as to permit their simultaneous movement from the air tube to the gas tube. The cell and the light source, when facing the gas tube, are isolated from smoke by a stream of air from the reference tube. Fouling of the gas tube can be compensated for. A method of bringing readings of smokemeters of different lengths to a common basis is derived. 8 refs. T. T.

2090. Patents. U.S.P. 2,630,228 (23.10.48; 3.3.53). O. A. Wright, E. H. Goddard, and R. H. Cole, assrs to Air Valve Inc. Fuel filter.

U.S.P. 2,630,793 (G.B. 23.11.46; 10.3.53). D. M. C. Best and R. C. Clerk. Upper-cyl lubricator for I.C. engines.

U.S.P. 2,631,730 (22.6.49; 17.3.53). H. Thomas, assr to Thomas Oil Cartridge Inc. Filter cartridge for lub oil clarifier.

U.S.P. 2,632,420 (1.5.50; 24.3.53). R. R. Crookston, assr to Standard Oil Development Co. Device for indicating piston over-stroking.

U.S.P. 2,632,430 (26.11.51; 24.3.53). C. MacSporran, assr to Phillips Petroleum Co. Safety fuel shut-off system for I.C. engines.

U.S.P. 2,632,432 (10.10.50; 24.3.53). R. I. Potter, assr to Standard Oil Co. I.C. engine. J. M. S.

Safety Precautions

2091. Dust and particle explosions. A. R. Myhill. *Mech. World*, July 1953, **133** (3408), 302.—Suspensions of combustible dust or oil mist in air can constitute serious explosion hazards under certain conditions. Explosions in coal mines, food stores, and the crankcases of marine engines have been traced to this cause. Precautions for avoiding these dangers, and methods of producing non-explosive atmospheres are described. 5 refs. T. T.

2092. Tank fires. H. Brunswig. *Erdöl u. Kohle*, 1953, **6**, 273–6.—Filling fires are mainly due to static, whilst emptying fires are mainly caused by iron sulphide. Ignition of gas-pockets in tank proximity is a subsidiary fire source. Types of tank explosion are described with illustrations. Earth bund walls are preferable to concrete,

fixed water sprays being of limited value. Chemical foam is being replaced by air-generated foam which should be applied within 15 min and at not less than 6 cm/min for 15 min. Fixed foam installations are preferable to mobile; cost of fire-protection installations is generally 10–15% of cost of new tank farm. V. B.

Miscellaneous

2093. The presidential address, 1953. "Fuel and Society." G. E. Foxwell. *J. Inst. Fuel*, July 1953, **26** (150), 3.—An historical review is presented which shows some of the social consequences of the rise of fuel technology in the nineteenth and twentieth centuries, particularly as they affected, or were affected by, industry and commerce, conditions of life, political thought, and Parliamentary action. The present position and future outlook are also discussed. 26 literature refs. D. K.

2094. Petroleum processing. P. F. Swanson and N. R. Adams. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1429–35.—A survey of the U.S. petroleum industry, with particular reference to fuels and petrochemicals. Synthetic processes are also discussed, together with possible future developments. E. J. C.

2095. The pollution of Britain's coastal waters. Anon. *Petrol. Times*, 21.8.53, **57** (1462), 855.—Some salient features are given from the "Report of the Committee on the Prevention of the Pollution of the Sea by Oil" (H.M.S.O. 2*s*. net.).

"Persistent" oils are defined, sources of pollution stated, and recommendations made regarding discharge of persistent oils.

Among other recommendations was one to amend the Oil in Navigable Waters Act 1922 to give full effect to the proposed preventive measures. G. A. C.

2096. Operative regulations concerning the new [German] petroleum revenue law. Anon. *Erdöl u. Kohle*, 1953, **6**, 349–52, 417–21, 502–5.—Discussion, in some detail, of newly issued regulations. Matters covered are: abolition of tare wt and replacement by average value; notes and explanations on the customs tariff; customs drawback regulations; petroleum tax regulations. V. B.

Corrigendum

Journal of the Institute of Petroleum for Aug. 1953, Vol. 39, No. 356, p. 418A, Abs. **1599**, line six should read "N/10" in place of "10N."

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British Standards:

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B.S. 1660 Pt 3: 1953. Machine Tapers. Pt 3. Quick-Release Tapers and Gauges for Quick-Release Tapers. Pp. 12. 4*s*. net, post free.

B.S. 2009: 1953. British Standard Code for Acceptance Tests for Turbo-Type Compressors and Exhausters. Pp. 50. 10*s*. net, post free.

B.S. 2012: 1953. Mould Die Sets for Injection Moulding Machines. Pp. 8. 2*s*. 6*d*. net, post free.

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Oilfield Exploration and Exploitation

Geophysics and Geochemical Prospecting

2097. European Association of Exploration Geophysicists. T. C. Richards. *Nature, Lond.*, 1953, **172**, 189–91.—Summary of the 4th meeting (2nd annual meeting) held in Paris, May 1953. 22 papers were presented, on the topics of seismic, electric, magnetic, and gravity methods of exploration geophysics. H. C. E.

2098. Patents. U.S.P. 2,637,839 (20.4.48; 5.5.53). R. G. Piety, assr to Phillips Petroleum Co. Rotational seismometer.

U.S.P. 2,638,001 (9.1.47; 12.5.53). H. M. Zinor, assr to Standard Oil Development Co. Force measuring device for use under water.

U.S.P. 2,638,176 (23.2.49; 12.5.53). W. W. Doolittle, assr to Stanolind Oil and Gas Co. Marine seismic surveying.

U.S.P. 2,638,402 (9.6.47; 12.5.53). B. D. Lee, assr to Texas Co. Seismic prospecting.

U.S.P. 2,638,578 (11.2.52; 12.5.53). R. G. Piety, assr to Phillips Petroleum Co. Capacitive seismometer.

U.S.P. 2,640,097 (21.10.49; 26.5.53). K. C. Crumrine, assr to Standard Oil Development Co. Precision switching assembly for electrical prospecting.

U.S.P. 2,640,186–7 (13.6.49; 26.5.53). A. F. Hasbrook, assr to O. S. Petty. Apparatus for recording time-break signals in seismic surveying. J. M. S.

Drilling

2099. Pressure of rocks on casing in drill holes. A. Salustowicz. *Nafta (Krakow)*, 1952, **8**, 299–302.—For casing inside formation loose all the way from top, vertical pressure $= p_z = \gamma h$, p_x (internal formation pressure) $= \frac{1}{C}\gamma h$.

$C = \left(\frac{1+\sin\rho}{1-\sin\rho}\right)$, ρ = angle of friction (15° to 45°); $C = 3$ approx in loose formations.

In loose formations p_0 (on casing wall) $= p_x = \frac{h}{10}\frac{kg}{\text{cm}^3}$; h in metres; γ taken as 2·5 gm/cc.

In loose formations under solid rock or clay p_0 must involve the elasticity of the upper layer, and varies from top, where $0 \leq p_0 \leq \gamma\frac{h}{C}$, to bottom where $\frac{\gamma w}{C} \leq p_0 \leq \frac{\gamma(h+w)}{C}$; w = thickness of loose formation.

In clays $p_z = \gamma h$, $p_x = \frac{\gamma h}{C} - \frac{2k'\cos\rho}{1+\sin\rho}$ or $\frac{\gamma h - k}{C}$; k' = cohesion, ρ varies from 5° to 45°. Radial, tangential, and vertical tensions. σ_r, σ_t, σ_z at the limit of turbulence R are related as $\frac{R}{dR}d\sigma_r = \sigma_t - \sigma_r$ and $\sigma_t + \sigma_r = \frac{2}{C}(\gamma h - k)$. Assuming that $\sigma_z = \sigma_t$ and $p_0 = \sigma_r$ then at a point on wall of casing of radius a

$$p_0 = \frac{2}{C+1}\left[\gamma\frac{h}{C} + \frac{k}{C(C-1)}\right]\left(\frac{a}{R}\right)^{C-1} - \frac{k}{C-1}.$$ M. S.

2100. Sliding bits. W. Paraszczak. *Proceedings of (Polish) Institute of Petroleum*, 1953, **22**, 12.—The elementary drilling problem is to make the hole drilled larger than the tool which drills it to allow for casing and free passage. Reamers and eccentrics have been tried, but for percussion drilling the cheapest solution is provided by Lodzinski's slanting bit of 1923 and its development "Lodzinski-IN" bit. The original was improved before the last war by Kulczycki, and it has recently been reintroduced. The bad reputation sliding bits have at one time acquired is due to their sensitivity to careless sharpening. The optimum angle of slant has been recalculated by IN (Petroleum Institute), and it is very critical. The appearance of the bit is not unlike that of an eccentric; its centre of gravity is symmetrically placed, and it differs from an eccentric in so far as its lower part is tapered and upper part has a protruding section, "jaw." It is pushed sideways by the impact of the tapered part on the ground. The same principles govern the original and the IN improvement type. Several tests were carried out using a 1 :: 4·5 model or 1 :: 7 model 1 inch long and an "artificial borehole" as well as natural soil. Frequency of 100–140 strokes/minute and strokes of 100 mm, 150 mm, and 200 mm were employed. A good all-round performance was obtained. Size of the hole varied according to the rock. Several full-size bits were tried out in the field, and progress was better than using eccentrics. High quality steel and careful sharpening reduced wear to minimum. In the paper several graphs, sketches, and drawings are given. M. S.

2101. Patents. U.S.P. 2,637,172 (8.7.48; 5.5.53). K. C. Howard, assr to Richardson and Bass. Offshore drilling platform.

U.S.P. 2,637,400 (15.4.46; 5.5.53). L. E. Brown and O. W. Williams. Well packer assembly.

U.S.P. 2,637,401 (30.11.50; 5.5.53). G. H. Ramsey, assr to Standard Oil Development Co. Drill stem packer with deflating means.

U.S.P. 2,637,402 (27.11.48; 5.5.53). R. C. Baker and M. B. Conrad, assrs to Baker Oil Tools Inc. Pressure operated well apparatus.

U.S.P. 2,637,527 (21.8.50; 5.5.53). J. B. Andrews. Well drilling device.

U.S.P. 2,637,590 (8.3.50; 5.5.53). J. E. Ortloff, assr to Standard Oil Development Co. Well bore retrieving tool.

U.S.P. 2,637,692 (27.10.50; 5.5.53). P. G. Nahin, assr to Union Oil Co of California. Drilling fluid comprising a mineral oil and a modified clay prepared by heating a hydratable clay at 250°–500° C for 0·5–10 hr, cooling, slurrying with a glycol or a glycol alkyl ether, allowing to stand, and drying.

U.S.P. 2,637,978 (25.4.46; 12.5.53). J. R. Evans, L. E. Elkins, and L. H. Klinzing, assrs to Stanolind Oil and Gas Co. Marine drilling structure.

U.S.P. 2,638,165 (24.1.48; 12.5.53). L. D. Barber. Well perforator.

U.S.P. 2,638,167 (28.6.48; 12.5.53). E. N. Jones. Seal for well tubing.

U.S.P. 2,638,168 (31.7.48; 12.5.53). A. S. Parks. Well packer.

U.S.P. 2,638,169 (11.2.47; 12.5.53). R. L. Crain, assr to Gray Tool Co. Apparatus for protecting the interior sealing surfaces of equipment used in the construction of oil wells, while passing a pipe into a previously landed well casing.

U.S.P. 2,638,316 (14.1.50; 12.5.53). G. E. Mullinix, assr to Byron Jackson Co. Power unit for a well pipe slip assembly.

U.S.P. 2,638,319 (29.11.50; 12.5.53). R. R. Crookston, assr to Standard Oil Development Co. Control mechanism for hydraulic system of rotary drilling rigs.

U.S.P. 2,638,320 (18.6.49; 12.5.53). E. L. Condra. Pipe cutter or reamer to cut through one side of pipe.

U.S.P. 2,638,321 (7.10.49; 12.5.53). C. C. Isbell. Underwater core barrel.

U.S.P. 2,638,322 (3.3.50; 12.5.53). E. L. Condra. Oil well casing cutter to cut side windows in misaligned pipe sections connected by an inclined pipe section.

U.S.P. 2,638,323 (3.12.48; 12.5.53). T. C. Bannon, assr (in part) to Lloyd Spencer. Cores are removed by directing explosive charges inwardly at the base of the core while protecting the surrounding wall and simultaneously placing tensile strain on the core. The core is severed across its base.

U.S.P. 2,638,324 (4.5.48; 12.5.53). G. F. Ball and E. M. Luce, assrs to Joy Manufacturing Co. Chuck mechanism for oil well drilling apparatus.

U.S.P. 2,638,671 (14.6.51; 19.5.53). K. Ramsey, assr to Geolograph Co. Apparatus for translating and plotting log charts from drilling time charts.

U.S.P. 2,638,373 (24.1.48; 12.5.53). N. W. Alford. Deep well fishing tool.

U.S.P. 2,638,681 (12.11.47; 19.5.53). M. M. Kinley and J. C. Kinley. Device for locating irregularities on the interior of well pipes.

U.S.P. 2,638,801 (21.6.48; 19.5.53). R. J. Klaasen and E. M. Olsen. Casing perforator.

U.S.P. 2,638,851 (30.11.51; 19.5.53). A. S. Soberg and A. Christensen, assrs to Sachris Development Co. Well driller clean-out pump assembly.

U.S.P. 2,638,981 (22.1.48; 19.5.53). T. C. Bannon and L. Spencer, assrs in part to J. D. Chesnut. Gun perforator actuator.

U.S.P. 2,638,987 (3.8.50; 19.5.53). E. L. Condra. Pipe repair sleeve for drill pipes.

U.S.P. 2,638,988 (12.2.51; 19.5.53). W. J. Williams. Reverse circulation wash-out mechanism for wells.

U.S.P. 2,639,169 (26.1.48; 19.5.53). M. R. Jones, assr to Oil Center Tool Co. Well head.

U.S.P. 2,639,512 (29.9.47; 26.5.53). J. C. Legrand, assr to Schlumberger Well Surveying Corpn. Apparatus for gauging bore holes.

U.S.P. 2,639,588 (22.3.48; 26.5.53). L. B. Durant and W. E. Padel, assrs to Alexander Shipyard Inc. Barge for offshore well drilling.

U.S.P. 2,639,770 (11.9.50; 26.5.53). T. A. Huber, assr to Standard Oil Development Co. Small gun for perforating casing in oil wells.

U.S.P. 2,639,773 (16.3.49; 26.5.53). J. C. Webber, assr to Atlantic Refining Co. Packer for wells.

U.S.P. 2,639,893 (23.4.52; 26.5.53). C. R. Pigott. Safety rope socket for well tubes.

U.S.P. 2,640,161 (1.10.41; 26.5.53). S. Krasnow and M. J. Test, assrs to Schlumberger Well Surveying Corpn. Energizing system for borehole radioactivity apparatus.

J. M. S.

Production

2102. Significance of well diameter in acidizing production wells. M. Mejak. *Nafta (Yugoslavia)*, May 1953, **5**, 154–7.—The relation between the well producing capacity and the well dia is analysed. By comparing Muscat's equation for the well producing capacity with Uren's transformation of the Poiseuille equation, a simple relationship has been developed between the well producing capacity, the distance between the wells, and the well dia.

$$q = \frac{k}{\ln \frac{R}{r^r}}$$

where q is the well producing capacity; R is the distance between the wells; and r is the well dia. The constant k is represented by

$$k = \frac{4\pi KT(P_1 z - \pi K^2 T)}{z^4}$$

where k is the permeability coeff; T is the pay thickness; z is the visc of liq, *i.e.*, of the oil–gas mixture; and P is the pressure in the centre of the well. (Author's Summary.)

2103. Electric heaters for periodical heating of oil wells. J. Ostaszewski. *Proceedings of (Polish) Institute of Petroleum*, 1953, **20**, 16.—A frequent occurrence in producing wells is a deposition of paraffin wax in the rock or in the equipment. The reasons for this are, first of all, a fall in well temp, and, secondly, faster removal and escape of lighter and gaseous hydrocarbons which acted as solvents for paraffin wax. Supersaturation of the crude with wax occurs, and then some slight impurity brings heavy deposition within a short time. Apart from careful exploitation, solvents and heating may be developed to remove wax.

Shallow wells can be heated by steam, deeper wells require either hot recirculated crude, chemical exothermic heating (*e.g.*, using NaOH, H_2O, and Al), or electrical heating. This last method may be applied periodically or continuously to the formation and to the pipes. Most Polish wells are suitable for periodical heating, and this also allows the use of the same heaters for several wells.

From calculations it appeared that for a well producing 200 kg of crude/day and accumulating it to a level of 20 m in the well, heat required to raise its temp by 50° C will be provided by little more than 10 kWh for heating the oil and approx 0·6 kWh for melting the wax (assumed to be 50 kg), but heat lost to the rocks will use in such circumstances 0·2 kWh/m/hr.

Laboratory investigations showed that the area of the heating element has little influence. Max temp reached depends on quantity of volatiles in crude, and excessive heating causes dist (when escaping vapours give up their latent heat to higher parts of pipe).

Thermostatically controlled heater was employed in a pilot scale experiment. Whilst temp of crude in a 10-inch pipe rose *ca* 50° C temp of the ground at 30 cm from it remained unaffected.

Full scale experiments are described in detail with drawings of the heater, connexions, and graphs of results and of production.

Thermostat has proved unnecessary in practice, and temp never rose above 45° C. Great heat losses were due to excessive convection, and a jute sack was inserted above the heater to stop it.

Construction of equipment is described in fair detail. Current is applied between pumping line and earth, and wooden blocks soaked in paraffin are used as insulators. For wells producing no more than 500 kg/day 8-kW heaters are adequate. In the 3 tested production rose by 7–12%, and pour point of crude rose by 25° C for 6 days and then fell to an intermediate value which shows that crude now contained most of the wax in solution.

Transport and Storage

2104. " Foam " cuts vapour losses. Anon. *Petrol. Process.*, 1953, **8** (7), 1017.—A method of reducing evaporation losses from cone-roof crude oil storage tanks has been developed by Standard Oil Co (Ohio). A " foam " layer of tiny hollow spheres, called " Microballoons," is spread over the surface of the oil in the tank. The " Microballoons " are small, hollow, phenolic resin balls, containing sealed-in gas, essentially nitrogen at atm pressure. An average of about 1·28 lb/sq. ft. of the particles will make up an inch layer on the oil surface, and will reduce the evaporation loss 80–90%.

J. W. H.

2105. New protective paint for tank heating coils. Anon. *Mot. Ship*, Aug. 1953, **34** (401), 212.—Hempel's Marine Paints Co Ltd have produced a paint claimed to be resistant to salt water, gasoline, crude and fuel oils, and various types of vegetable oils, whether carried separately or mixed. The paint is brushed on to the pipes after cleaning and sand-blasting, the pipes are then heated, a second coating applied, and the pipes baked again. It is stated that, for an 18,000-ton tanker, the paint would cost about £250 with an estimated £250 to cover cost of application and heat treatment.

U. M.

2106. Pipelines instead of railway tanks. V. Zerjavic. *Nafta* (*Yugoslavia*), May 1953, **5**, 157–62.—The expected increase in the Yugoslavian consumption of petroleum derivatives in the course of the coming 10 years will inevitably have as a consequence the problems of both increasing the domestic raw oil production and providing the necessary transportation facilities. At present petroleum and its derivatives are transported by railway tanks, but the costs are high, amounting to 25% of the value of the goods.

It is the author's opinion that, in order to enable the transport of petroleum on some routes and in sufficient quantities, the building of a pipeline of 6 inches and 200 kilometres length to connect the seaport Bakar with the refinery at Sisak, as well as another one of 30 kilometres length extending from the Moslavina oilfields to Sisak, would seem justifiable from an economic point of view. These pipelines at an annual turnover of 600,000–800,000 tons, would pay out capital investments in no more than 2 years, because transportation costs could be reduced 3–4 fold.

The pipeline Bakar–Sisak may be of interest for the Middle European countries too, as it could continue the transportation route along the rivers Save and Danube. In that case special consideration should be paid to the size of the pipeline, *i.e.*, to the quantities of crude to be transported. (Author's Summary.)

2107. Solving pipeline suspension problems. C. A. Sweningsen. *Oil Gas J.*, 10.8.53, **52** (14), 107.—A chart is given which can be used to : (*a*) select cable size and tower height ; (*b*) determine size of fuelling line ; (*c*) find length of each hanger. This aid was recently used for design of a 660-ft emergency crossing of the Santa Ynez River, Lompoc, Calif.

G. A. C.

Refinery Operations

Refineries and Auxiliary Refinery Plant

2108. Trinidad Point-à-Pierre refinery. V. A. Swaminathan. *Petrol. Engr*, April 1953, **25** (4), C32.—New cat cracker added to refinery. Main units in new construction comprise vacuum unit for cat feed preparation, fluid cat cracker, gasoline treating and gasoline re-run unit to handle cracked gasoline. Cracker capacity is 15,000 b.s.d., using microspheroidal silica-alumina cat. Revamping of existing refinery equipment was also carried out. G. H. G.

2109. Electrification and the modern oil refinery. T. B. Sansom. *Petroleum, Lond.*, May 1953, **16** (5), 130–4.—Important items of electrical equipment essential to the economic working of an oil refinery are dealt with. Initial requirements are: (1) continuous design system of power distribution to allow for majority of failures experienced with electrical generation and distribution; (2) efficiency; (3) maintenance—choose equipment with minimum auxiliaries and least number of moving parts; (4) standardization.

3 methods of generation are possible: (1) generation of all electrical power; (2) partial generation of all power, with balance from grid; (3) all power from grid, low-pressure steam generation independently. (2) is most common for refineries. For distribution, important to keep current value to a max to cut losses; best method is to keep distribution voltage as high as possible for as far as possible. The max economy must be considered in relation to the safety of operation.

With machines requirements are: (1) reliability; (2) reasonably high efficiency; (3) low maintenance requirements; (4) inflammability. Majority of power generated is A.C., with D.C. obtained from a mercury arc rectifier. The inflammable conditions should be considered for control gear and lighting. G. H. G.

2110. " Tools " make processes possible. A. L. Foster. *Petrol. Engr*, May 1953, **25** (5), C3–4.—Biggest improvement in American refining in recent years is in catalysis, especially cat cracking and reforming. Most outstanding single accomplishment technically and economically of the post-war period, processwise, is opening of " bottlenecks " in the cat cracking units to increase throughput as much as 100%.

Economics is receiving more attention, *e.g.*, use of " package type " TCC cat cracker standard heat exchangers, pumps, etc. The main development in cat reforming is the production of petrochemicals and their intermediates, which may soon overshadow the original purpose of these units for ungrading naphthas. With increasing alkylation demand, existing units of low efficiency have been revamped, giving higher throughput efficiency and quality. Units employing anhydrous hydrofluoric acid cat have been redesigned to use sulphuric acid.

Recovery of pure or conc products from reaction streams containing mixtures of various hydrocarbons is one of the operations of major importance to receive attention in recent years. Processes mentioned are Udex, Arosorb, Autofiner. For fractionation, developments in tray design are the Koch-Kaskade tray, and more recently, the Shell Turbogrid. G. H. G.

2111. Wire mesh removes liquids from refinery vapour. S. C. Reynolds. *Oil Gas J.*, 10.8.53, **52** (14), 117.—Nature and effect of entrainment of liq in a gas and various preventives are discussed. A wire-mesh entrainment separator made by assembling layers of knitted (not woven) wire mesh into a pad consisting of a multiplicity of unaligned asymmetrical openings removes the entrainment by impingement and accumulation in depth.

Units should be installed horizontally. It is claimed that more than 99% of liq entrained is removed and returned. G. A. C.

2112. Take another look at economic pipe sizing. H. F. Rase. *Petrol. Refin.*, 1953, **32** (8), 141–3.—A method is presented for the simple and rapid estimation of installed piping costs based on an analysis of material, erection, and fabrication costs.

R. D. S.

2113. Compressor detonation dampened by cooling scavenger air. F. R. Cramer. *Oil Gas J.*, 24.8.53, **52** (16), 119.—Southern Counties Gas Co employ evaporative cooling of the scavenging air stream on large, 2-cycle gas engines at their Blyth, California, compressor station. The results were encouraging in preventing detonation in areas where high temp were encountered. Tables show comparison of summer and winter operations and scavenging air temp tests, and figures depict the evaporative cooling unit and scavenging air manifold. G. A. C.

2114. New lift method for moving solids. Anon. *Petrol. Process.*, 1953, **8** (7), 1024–5.—A new method has been developed for the movement of granular solids used in petroleum operations. "Hyperflow," as it is termed, uses gas as the motivating agent, and the solids are transported through the system in a relatively compact mass. Thus a "dense phase" technique is employed, and much lower gas and solids velocities are required than in other similar lifting systems—on the order of 10–12 f.p.s. The solid velocity and the gas velocity in the "dense phase" system are essentially the same. A much higher pressure differential is required to move the solids in this type of system—as much as 4–5 times as great as in the "dilute" phase system.

A Hyperflow system in operation on a continuous contact coking unit can move 750 tons/hr of coke particles through a 12-inch line. A 36-inch line in a conventional dilute phase lift system would only move half this amount. J. W. H.

2115. Pump selection. R. L. Jacks. *Oil Gas J.*, 10.8.53, **52** (14), 127; 17.8.53, **52** (15), 153; 24.8.53, **52** (16), 143.—This part of the Engineering Reference Section deals with design conditions, such as differential pressure, liq horsepower, max temp, and "shutoff" pressure.

Factors to be taken into account are discussed in making max use of existing pumps. It is stressed that the performance (head *vs* capacity) curve for each pump be obtained.

It is then shown how to make a design calculation, some relationships to estimate the effect of changing impellor size being given. G. A. C.

2116. Heat transfer. B. E. Lauer. *Oil Gas J.*, 10.8.53, **52** (14), 132; 24.8.53, **53** (16), 153.—Pt 40 of this series continues with coeff of heat transfer through film between cool inclined surface and condensing vapour; and outside of finned tube and a gas or fluid.

Pt 41 continues with coeff of heat transfer through film between a sphere and a fluid and air. G. A. C.

2117. Viscous flow. A. V. Brancker. *Petroleum, Lond.*, May 1953, **16** (5), 119–24.—Under stress, material may deform elastically or exhibit viscous flow, but under certain stress conditions, elastic solids may exhibit flow properties and viscous materials react elastically. With petroleum oils or liq of low visc and rigidity, the decay stress is rapid, the flow properties being defined by a single constant derived from the Poiseuille equation. No linear relationship between flow rate and stress results for non-Newtonian materials, and for flow through capillaries, the Poiseuille equation is modified. Corrections to this equation are dealt with. The non-linearity of flow–force plot does not necessarily prove the material is non-Newtonian. Measurement of the flow properties of highly viscous non-Newtonian materials by pressure extrusion through circular dies is cited.

Various flow equations have been proposed, but a satisfactory flow equation for a non-Newtonian fluid has not been found. Best approx flow equation is a modified form of Eyring's equation. The importance of flow kinetics in solutions of flow problems is stressed. G. H. G.

2118. Heat transfer at viscous flow of liquids in rectangular channels and circular pipes. B. S. Petukhov and E. A. Krasnoshchekov. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1953, 865–81.—Tests were made with 2 mineral oils (visc 20° C 21·4 and 1392 cs) over temp range 20°–150° C; drawings of test equipment given. 199 experimental points were determined (147 in laminar region). The following formula is derived: $Nu = aC(Pr \cdot d/l)^{1/3} Pr^{-b}(\mu_{wall}/\mu_{liq})^{-c}$ where C is a constant depending on the geometrical form of the pipe and varying from 0·79 for rectangular to 1 for circular. a, b, and c depend on whether the liq is being cooled or heated and, for the two cases, are respectively a 5·25, 2·25; b 0·2, 0·03; c 0·06, 0·15. V. B.

Distillation

2119. To help you design fractionators. Pt 5. Distillation of ternary mixtures. R. R. White. *Petrol. Process.*, 1953, **8** (7), 1026–31.—In a column containing a stripping and rectifying section, there are usually 3 major variables, providing the feed is of fixed comp and thermal condition, and is introduced to the optimum stage to the column which operates at a fixed pressure. As a rule the reflux ratio, one of these variables, is fixed, so that only 2 variables are available with which to specify the separation. With ternary systems 9 ways are available, since the top and bottoms product can be each specified in 3 ways.

These specifications are discussed, and a fractionation envelope is established for a ternary system. The number of stages at minimum and total reflux are also calculated for a specific example. J. W. H.

2120. Fractionator vapour load. R. H. Shatz and B. Williams. *Petrol. Engr.*, April 1953, **25** (4), C61–2.—Calculation of allowable vapour load for a perforated plate in a fractionating column is given. Few data are available on a perforated plate fractionating tower, and " rules of thumb " should give workable designs. A numerical example is given. G. H. G.

Absorption and Adsorption

2121. Versatile process for aromatics recovery. F. R. Shuman and D. G. Brace. *Petrol. Engr*, April 1953, **25** (4), C9.—The recent Arosorb process is applicable from benzene to aromatics in the gas oil range. Using silica gel adsorption, the method separates aromatic compounds from paraffins and naphthenes. Amount of feed regulated so that all aromatics are retained by the gel, and the stripped feed then displaced by pentane or butane (push liq). Aromatics are recovered from the gel by washing with an aromatic liq, which boils outside the range of the feed. Alumina-type (desorbent) driers are used to remove water from the feed. Push and desorbent should boil reasonably far from each other and from the feed to facilitate the separations by dist. For good separation, liq entering the gel column should have max visc of 0·65 centipoise. Feed stocks range from benzene reformate, kerosine, to recycle cat gas oil.

Major expense is the dist facilities. For increased efficiency, the push has been eliminated by using a desorbent of 65% aromatic content, thus eliminating one large dist tower. Further reduction in dist load occurs as purity-recovery requirements are decreased. An Arosorb plant involves no corrosion problems, no hard-to-handle chemicals, and operates without excessive heat or need for refrigeration. G. H. G.

Solvent Extraction and Dewaxing

2122. Solvent extraction of lubricating oils. F. Sef. *Nafta (Yugoslavia)*, June 1953, **6**, 169–78.—The article presents a literature survey on data needed for the design of solvent extraction processes such as solvent refining of lub oils. The following items are included : (1) phase equilibria ; (2) methods of calculation ; and (3) performance characteristic of solvent extraction equipment. Data on flow capacities and efficiencies of laboratory and commercial equipment for solvent refining of lub oils are listed. (Author's Summary.)

Cracking

2123. Catalytic reforming in the U.S.A. Anon. *Petroleum, Lond.*, May 1953, **16** (5), 125–7.—Cat reforming can now compete with thermal reforming. Processes under development or in commercial operation in the U.S. include fixed-bed hydroforming, U.O.P. platforming, Atlantic platinum cat reforming, fluid hydroforming, Houdriforming, and Thermofor cat reforming. Processes are dealt with, operating conditions, yields, qualities. At present, operating costs per brl feed are only slightly higher than for thermal units, with gasoline yields and octane level much superior. In Europe, with lower octane requirements, it is thought that existing thermal reforming units will not so readily become obsolete. G. H. G.

2124. " Inside story " of a Houdriflow cat-cracker. Anon. *Petrol. Engr*, April 1953, **25** (4), C42.—A diagram shows details of each step in operation of a Houdriflow cat cracking unit. Cat circulation controlled by lift operating conditions, eliminating the necessity of valve adjustments in the cat lines. Cat deposit is uniform on all particles, facilitating regeneration control. G. H. G.

2125. Newest TCC packaged unit on stream. A. L. Foster. *Petrol. Engr*, April 1953, **25** (4), C53–5.—Thermofor cat cracker—max throughput and operating efficiency with minimum cost accomplished by use of standard prefabricated units in making up design of the plant unit divided into 4 sections, with 5th as polymerization section. Major innovation is the gas-lift principle for handling the regenerated cat. Plant includes feed preparation section, cat section, fractionation section, and gas recovery. An oil-well derrick type of supporting structure also serves as a permanent rig in repairing or replacing any items in the unit. Flexibility and economy of operation in all phases, maintenance as well as on-stream, are ideas in design of the unit. G. H. G.

2126. How to predict polyform gasoline octane. J. D. Wall. *Petrol. Process.*, 1953, **8** (7), 1032–5.—The polyform process is a modification of thermal reforming by which low O.N. naphthas and petroleum gases are converted into gasoline. The gas feed, consisting mainly of butane and lighter hydrocarbons, is absorbed in various ratios with the naphtha. The mixture is then fed to a conventional furnace in which the conversion to high O.N. gasoline takes place.

An empirical correlation is given relating the operating factors and the O.N. of the gasoline produced from a polyform unit in terms of temp, circulation rates, charge naphtha gravity, and naphtha dist. A nomograph of this equation is also presented. The steps involved in the equation and nomograph are carefully explained, and an example calculation of the O.N. is also included. J. W. H.

2127. Hyperforming. C. Berg. *Petrol. Process.*, 1953, **8** (7), 1018–23.—Hyperforming is essentially a general purpose reforming and stock upgrading operation utilizing a moving bed of cat with continuous regeneration. The reforming of straight-run naphthas can be carried out as well as the reforming of blends of straight-run and cracked stocks to effect uplifts of octane value in the liq yield.

In the commercial application of hyperforming a cobalt–molybdate cat is used with the operating pressure near 400 p.s.i.g. Reactor temp are in the range of 800°–900° F. A recycle stream of hydrogen is used in carrying out the cat reaction.

By the use of continuous reaction, circulation of cat, and regeneration in this process, a substantial economy in plant construction is effected, and maintenance is reduced over that of cyclic processes.

A few of the details are given of the cat conveyance, reactor design, and methods of hydrogen economy ; drawings are also presented of the feed tray construction and cat flow control. J. W. H.

Polymerization

2128. Patents. U.S.P. 2,626,289 (30.3.50 ; 20.1.53). F. R. Russell, assr to Standard Oil Development Co. A non-regenerative cat process for polymerizing olefins which comprises passing the olefins through a first zone containing a well mixed suspension of finely divided solid polymerization cat *A* in fluid hydrocarbon under conditions whereby most of the olefins are polymerized and polymerizing remaining olefins in a second poorly mixed dense zone of *A*.

U.S.P. 2,626,290 (30.3.50 ; 20.1.53). W. K. Fell and J. D. Leslie, assrs to Standard Oil Development Co. Non-regenerative process for polymerizing olefins by contacting with an agitated suspension of a finely divided cat comprising phosphoric acid on a solid carrier and, as diluent, finely divided silica gel, bauxite, or alumina (10 to 50 wt % based on cat) in fluid hydrocarbon to prevent agglomeration of the cat. In 2,626,291, the diluent has a small amount of phosphoric acid deposited on it ($<20\%$ less than on cat) sufficient to minimize loss of cat activity. In 2,626,293, the silica gel diluent has an original surface area of >450 m²/g which is reduced to 50 to 300 m²/g by heating prior to adding the suspension.

U.S.P. 2,626,292 (9.2.51; 20.1.53). E. J. Gornowski, assr to Standard Oil Development Co. Normally gaseous olefins are polymerized by contacting at 350° to 600° F/200 to 1200 p.s.i., so that only one fluid state exists, with a finely divided phosphoric acid impregnated carrier, a product stream containing entrained cat being withdrawn from the reactor, partially condensed to form a heavy phase containing cat, which is recycled, and a cat-free light phase.

U.S.P. 2,625,525 (17.11.49; 13.1.53). C. S. Lynch, assr to Phillips Petroleum Co. A latex prepared by emulsifying a mono-olefinic org compound *A*, 0·3 to 15% of a polybutadiene, based on wt of *A*, having a mol. wt. 500 and visc <10,000 S.S.F. at 100° F in aq medium, in an oil-in-water type emulsion in presence of sulphur dioxide stoichiometrically in excess of *A*, and interacting the components to produce a terpolymer.

U.S.P. 2,625,538 (8.6.51; 13.1.53). W. J. Sparks and J. F. Nelson, assrs to Standard Oil Development Co. In copolymerization of *iso*butylene with C_{4-6} conjugated diolefins at −40° to −164° C in presence of a dissolved Friedel–Crafts cat, mol. wt. of copolymer is controlled by adding 0·001 to 15% by wt, based on olefins, of a C_{4-16} mono-olefin having a lower tendency to polymerize than *iso*butylene.

U.S.P. 2,625,537 (2.6.47; 13.1.53). I. M. Kolthoff and W. J. Dale, assrs to Phillips Petroleum Co. Production of synthetic rubber by copolymerizing 1 : 3-butadiene mixed with a minor amount of styrene in aq emulsion at 0°–50° C in presence of a composition comprising 0·05–2 parts of a diazothioether of formula RN=NSR′, where R represents an aromatic radical and R′ represents an aromatic, *cyclo*alkyl, or aliphatic radical, 0·03–1 part of a water-sol ferricyanide, 0·05–1·4 parts of a C_{6-16} alkyl mercaptan, all being parts by wt 100 parts of monomer.

U.S.P. 2,624,726 (2.12.49; 6.1.53). G. E. Serniuk, assr to Standard Oil Development Co. Copolymerizing a benzene hydrocarbon *A* free from olefinic unsaturation with a minor proportion of a C_{4-6} conjugated diolefin *B* by cooling the mixture to 0° to −40° C, adding a soln of aluminium chloride in an inert solvent of concn 2–3·5 g/100 cc, additional *B* being added incrementally until ratio total *B* : *A* is 50 : 50 to 75 : 25 and separating the resulting hard resin.

U.S.P. 2,626,945 (11.7.49; 27.1.53). F. J. Carlin, assr to United States Rubber Co. Poly ethylenically unsaturated esters of alcohols of formula $RCH{=}CRCH_2X$, wherein one R = H and other R = H, Cl, Me, Et, or Ph, X = OH or a hydroxyalkoxy radical, are polymerized by heating at 25°–150° C in presence of a free radical type polymerization initiator to sol unsaturated polymers in increased yields by adding <0·2 mol of *cyclo*hexene, or an acyclic alkene of 5–10 carbon atoms, per mol of ester. An interpolymer formed from 1 mol diallyl fumarate, 0·2–8 mol of di-*iso*butylene and 0·1–8 mol of styrene is claimed.

U.S.P. 2,625,539 (2.6.49; 13.1.53). V. L. Folt, assr to B. F. Goodrich Co. Homopolymerization of vinyl chloride in aq medium containing a cat-activator combination consisting of a peroxygen compound and silver nitrate, sulphate, acetate, chlorate, or lactate in amount to provide a silver ion concn equiv to that produced by 0·04–0·4 wt % silver nitrate based on vinyl chloride, the mixture being agitated at 0°–100° C.

U.S.P. 2,624,724 (26.2.48; 6.1.53). H. F. Park, assr to Monsanto Chemical Co. Polymerization of vinyl chloride in aq emulsion at pH 5–8 in presence of a water-sol per-compound cat and an alkali metal sulphonate dispersing agent, the polymer being recovered by evaporating the water, the wt ratio water : vinyl chloride being 30 : 70, the dispersant being 0·01–0·5% of monomer, and amount of cat being sufficient to produce 0·00001–0·01 parts available oxygen per 100 parts of water and not more available oxygen than is contained in 0·06 parts of potassium persulphate per 100 parts of monomer.

U.S.P. 2,626,252 (12.11.48; 20.1.53). P. O. Tawney, assr to United States Rubber Co. Interpolymerization of a 2-dipropenyl ester of a C_{4-8} alpha-unsaturated alkenedioic acid and from 10–90 mol %, based on total mixture, of an ω-trichloro-C_{3-5} alkene.

U.S.P. 2,626,254 (29.11.48; 20.1.53). W. T. Miller and J. T. Maynard, assrs to U.S.A. (U.S. Atomic Energy Commission). A completely halogenated (F, Cl) acetyl halide or acetic anhydride dissolved in trifluorochloroethylene *A* is converted to the peroxide *B* by contact with an inorg metal peroxide at the temp at which *B* decomposes, *A* thereby being polymerized. V. P. P.

Alkylation

2129. How Koppers makes ethylbenzene. Anon. *Petrol. Process.*, 1953, **8** (7), 1048–9.—Ethylbenzene is produced by Koppers Co, U.S.A., by an alkylation process but, instead of the familiar HF or sulphuric acid cat used by the oil industry for aviation alkylate, this Friedel–Crafts reaction employs aluminium chloride. 2 basic simultaneous reactions take place; first, the alkylation of ethyl chloride with benzene to ethylbenzene, and second, the addition of hydrogen chloride, also formed in the first reaction, to ethylene to form ethyl chloride.

The reactor in this 90 million lb/year plant has an acid-proof lining to resist corrosion from the cat which is in the form of a slurry. The mixture in the reactor is kept well agitated since the cat has a tendency to settle out as a "mud."

A schematic diagram of the whole of the unit is given. J. W. H.

2130. Patents. U.S.P. 2,626,966 (3.12.49; 27.1.53). R. M. Kennedy and A. Schneider, assrs to Sun Oil Co. Alkylation of an aromatic hydrocarbon with a $C_{<5}$ saturated hydrocarbon containing <1 tertiary H atom by contact with a *tert*-alkyl monofluoride and BF_3 as cat.

U.S.P. 2,626,967 (6.2.51; 27.1.53). J. L. Darragh and G. B. Johnson, assrs to California Research Corpn. In the cat alkylation of benzene hydrocarbons with C_{8-18} olefins, the alkylate fraction b.p. 475°–650° F is deodorized by contacting with a silica–alumina adsorbent having a wt ratio $SiO_2 : Al_2O_3$ of $>1{\cdot}0$–10. V. P. P.

Special Processes

2131. New ethylene oxide process. A. L. Foster. *Petrol. Engr*, April 1953, **25** (4), C38–9.—Production of ethylene oxide by direct oxidn of ethylene over a silver cat in a "confined" fluid-bed system. Time of residence of the ethylene–air mixture in contact with the cat is critical. Cat regeneration is not needed. To extract the oxide from the unreacted gases, water is used as absorbent. The oxide is stored as liq condensate under an inert gas. Cooling agent, Dowtherm, is used in the shell space around the banks of reaction tubes to absorb heat from the exothermic reaction. A flow-chart of the process is given. G. H. G.

2132. Air-oxidation of butane. D. P. Thornton. *Petrol. Process.*, 1953, **8** (7), 1041–4.—A new oxidn process utilizing 95% normal butane as charging stock will produce 1·8 million lb of glacial acetic acid/week. This plant at Pampa, Texas, of the Celanese Corpn of America, also produces methyl alc, acetaldehyde, and acetone with the acetic acid, and employs unusual features. The details of the oxidn process are not disclosed. A unit has also been constructed to convert all the acetic acid produced to acetic anhydride.

Air cooling wherever possible is used on the new plant, and all the dist towers utilize sieve trays of special standard based on the column dia, and anticipated loading for dist, absorption, and extraction.

Extensive use is made of asphaltic-base paints to minimize corrosion on the metalwork. J. W. H.

2133. Petrochemical capacities hit new highs. A. L. Foster. *Petrol. Engr*, April 1953, **25** (4), C69.—Annual growth of petrochemical industry is 14% on each previous year, producing 70% of the total organic chemical output of the U.S. and Canada. Survey of petrochemical operation in 1953 is given, products, and quantities. G. H. G.

2134. First platreater on stream. Anon. *Petrol. Engr*, May 1953, **25** (5), C20–1.—The platreater refines aromatic concentrates prior to separation in a Udex unit. Developed to hydrogenate olefins and destroy sulphur compounds to facilitate the operation of the Udex unit for high quality aromatic products. Excess hydrogen, produced in either motor fuel or aromatic runs, is cycled through the platreater to saturate olefins to paraffins. The flow process is outlined. G. H. G.

2135. Don't burn your excess hydrogen. H. Heinemann. *Petrol. Process.*, 1953, **8** (7), 1036–40.—Many of the new processes introduced to the petroleum industry recently,

such as Houdriforming and Fluid Hydroforming to name two, involve as their major reaction the dehydrogenation of naphthenes to aromatics and the production of about 3200 cu. ft. of hydrogen per b.l of naphthene charged. This large quantity of hydrogen available as a by-product is quite pure, and usually at an elevated pressure. The refiner therefore utilizes this gas as a fuel or sells it to the chemical industry unless hydrogenation facilities are available.

The use of hydrogen in various branches of the chemical and petroleum industry is reviewed, with emphasis on liq and vapour phase hydrogenation. The feasibility of these applications depends to a large extent on the economic considerations which vary from refinery to refinery and on the volumes of hydrogen available. J. W. H.

2136. Patents. U.S.P. 2,630,378 (23.7.49; 3.3.53). W. P. Gee, assr to Texaco Development Corpn. Synthesis gas is made by reacting high b.p. hydrocarbons at 1600°–2600° F with oxygen in an amount insufficient for full conversion to hydrogen and carbon monoxide, separating carbonaceous solids formed and reacting the solids in a separate stage with steam and oxygen to produce more hydrogen and carbon monoxide.

U.S.P. 2,630,447 (G.B. 3.9.42; 3.3.53). M. Steinschlaeger. Fischer–Tropsch process in which carbon dioxide is separated from the residual reaction gases and recycled for the production of synthesis gas by reaction with hydrocarbon gases, and the rest of the residual reaction gases is reacted with hydrocarbon gases and steam to produce a second synthesis gas.

U.S.P. 2,630,456 (1.7.49; 3.3.53). E. R. Bell and W. E. Vaughan, assrs to Shell Development Co. *tert*-Butyl hydroperoxide is made by reacting *tert*butyl alcohol, an aq soln of hydrogen peroxide containing 30–50% H_2O_2 and a strong mineral acid at 40°–70° C.

U.S.P. 2,630,461 (Germany 1.10.48; 3.3.53). H. Sachsse, T. Kosbahn, and E. Lehrer. In the production of acetylene by incomplete combustion of hydrocarbons after preheating, the streams of hydrocarbons and oxygen, before being mixed, are brought to the same pressure, and at least one of the streams is split into partial streams, and all the partial streams are united in mixing devices arranged in parallel.

U.S.P. 2,631,086 (27.10.49; 10.3.53). O. W. Moak and W. E. Spicer, assrs to Standard Oil Development Co. Water gas shift cat is prepared by impregnating iron oxide with an aq soln of chromic acid, extruding and pelleting the mixture, and heating the pellets at 1000°–1300° F.

U.S.P. 2,631,087 (2.8.50, 10.3.53). L. K. Herndon, assr to Fluor Corpn. Sulphur is recovered from acid sludge by mixing the sludge with incandescent coke at $\leq$500° F to form coke and a gaseous mixture containing SO_2, scrubbing the gas to remove coke breeze, water, and oil vapour, mixing the gas with hydrocarbon-containing vapour, preheating, and reducing the SO_2 to S by contacting with incandescent coke at 1200°–1600° F.

U.S.P. 2,631,094 (31.8.45; 10.3.53). F. L. Symonds, assr to Standard Oil Co. Synthesis gas is made by injecting natural gas into a fluidized bed of a reducible metal oxide at 1500°–3000° F and treating the products with additional natural gas in a second reaction zone at 1200°–2000° F.

U.S.P. 2,631,107 (15.12.50; 10.3.53). G. T. Leatherman, assr to Phillips Petroleum Co. Carbon black containing sulphur is made by reacting a hydrocarbon having a b.p. of 400°–800° F with SO_2 in the presence of HF at 300°–450° F and under a pressure sufficient to maintain liq phase conditions.

U.S.P. 2,631,159 (31.1.45; 10.3.53). P. C. Keith, assr to Hydrocarbon Research Inc. Method of carrying out Fischer–Tropsch process with a fluidized cat.

U.S.P. 2,631,160 (29.3.49; 10.3.53). C. B. Linn, assr to Universal Oil Products Co. Unsaturated hydrocarbons of $\leq$8 carbon atoms are oxidized with free oxygen in the presence of hydrogen fluoride.

U.S.P. 2,631,161 (26.2.49; 10.3.53). T. B. Haufe and J. G. Iverson, assrs to Universal Oil Products Co. Continuous process for producing dimethyl hydrogen phosphite.

U.S.P. 2,631,170 (13.2.43; 10.3.53). R. D. Fowler, assr to U.S.A. (Atomic Energy Commission). Fluorocarbons are made by reacting manganese or cobalt trifluoride with a hydrocarbon vapour at 150°–400° C.

U.S.P. 2,631,171 (27.8.47; 10.3.53). J. S. Newcomer. Hexachloro*cyclo*pentadiene is made by reacting trichloroethylene and carbon tetrachloride in the presence of a Friedel–Crafts cat and pyrolysing the product at 280°–800° C.

U.S.P. 2,631,173 (4.1.49; 10.3.53). J. C. Hillyer and J. V. Smith, assrs to Phillips Petroleum Co. 1 : 5-*cyclo*Octadiene is made by passing 1 : 3-butadiene in the vapour phase through an empty tube at 600°–1100° F and at a pressure of 20–250 p.s.i.

U.S.P. 2,631,933 (15.10.47; 17.3.53). W. A. Herbst, assr to Standard Oil Development Co. Manufacture of synthesis gas from gaseous hydrocarbons using a dense fluidized bed of a metalliferous oxygen carrier. A fluidized classification zone, in which the particles too large for fluidization are separated from smaller particles, is situated between the oxidn and regeneration zones.

U.S.P. 2,631,934 (3.4.46; 17.3.53). W. K. Lewis, assr to Standard Oil Development Co. Gases rich in CO are made from CO_2, steam, and O_2 by contacting with a fluidized bed of carbonaceous material at 1500°–2000° F. The solids are transferred to a second zone, in which they are used to produce the feed gases for the first zone.

U.S.P. 2,632,014 (3.11.51; 17.3.53). W. F. Gresham, assr to E. I. du Pont de Nemours and Co. High mol. wt. hydrocarbons are made by heating a mixture of CO, H_2, water, and an acidic reagent in the presence of a ruthenium-containing substance at 180°–225° C under a pressure of 200–800 atm.

U.S.P. 2,632,015 (29.6.49; 17.3.53). M. B. Kratzer, assr to Stanolind Oil and Gas Co. Regeneration of iron cat used in the Fischer–Tropsch process by contacting it with ethanol at 540°–700° F.

U.S.P. 2,632,016 (28.12.49; 17.3.53). W. H. Horne and V. L. Crawford, assrs to Gulf Research and Development Co. Fischer–Tropsch process carried out in presence of recycle gases.

U.S.P. 2,632,017 (17.6.47; 17.3.53). Du Bois Eastman and L. P. Gaucher, assrs to Texas Co. Fischer–Tropsch process carried out in presence of recycle gases and methane, ethane, or propane.

U.S.P. 2,632,021 (6.3.51; 17.3.53). S. B. Robinson and J. Rehner, assrs to Standard Oil Development Co. Esterification carried out in the presence of an unsaturated aliphatic dicarboxylic acid.

U.S.P. 2,632,026 (18.2.50; 17.3.53). J. C. Conner, assr to Hercules Powder Co. Alkyl-substituted aromatic compounds are contacted in the liq phase with an oxygen-containing gas in the presence of gaseous ammonia to form a tertiary organic hydroperoxide.

U.S.P. 2,632,027 (17.6.49; 17.3.53). F. M. Smith, assr to Phillips Petroleum Co. Oxidn of aromatic hydrocarbons to phenols in the presence of liq HF.

U.S.P. 2,632,690 (2.1.48; 24.3.53). H. V. Atwell, assr to Texas Co. Production of synthesis gas from gaseous hydrocarbons and steam or carbon dioxide using a fluidized cat and a finely divided inert solid heat carrier.

U.S.P. 2,632,713 (29.10.48; 24.3.53). J. C. Krejci, assr to Phillips Petroleum Co. Carbon black produced from gas oil in the presence of a combustible compound of silicon, boron, or germanium.

U.S.P. 2,632,731 (G.B. 17.6.48; 24.3.53). W. von Ediger, assr to Technical Assets Inc. Production of acetylene from liq hydrocarbons by electric arcing.

U.S.P. 2,632,771 (7.11.49; 24.3.53). D. H. White, assr to Phillips Petroleum Co. In the synthesis of urea from ammonia and carbon dioxide, the upper portion of the reaction mixture is maintained at a temp suitable for the synthesis and the lower portion is maintained at a temp below the crystallization point of urea. During the reaction a mixture of solid urea, ammonium carbamate, and water is withdrawn from the lower portion, the solid urea separated and a portion of the mother liquor is recycled to the urea synthesis.

U.S.P. 2,632,772–3 (G.B. 1.4.47; 24.3.53). G. P. Armstrong, R. H. Hall, D. C. Quin, and K. H. W. Turck, assrs to Hercules Powder Co. *iso*Propylbenzene hydro-

peroxide is made by contacting *iso*propylbenzene (I) and alkali in the liq phase with oxygen at 70°–150° C, adding fresh I as the oxidn proceeds and adding alkali sufficient to neutralize any carboxylic acid formed during the oxidn.

U.S.P. 2,632,774 (18.11.49; 24.3.53). J. C. Conner and A. D. Lohr, assrs to Hercules Powder Co. In the oxidn of alkyl-substituted aromatic compounds to *tert*-organic hydroperoxides by means of oxygen in the presence of an alkali or alkaline earth metal oxide or hydroxide at a temp between 70° and 145° C, the oxygen is passed through the reaction medium for a time which is between 0·1 hr and a time $>$ that defined by the equation $\log_e A = 11{\cdot}672 - 0{\cdot}0774t$, where A = time in hours and t = temp of the reaction medium.

U.S.P. 2,633,416–17 (3.12.47; 31.3.53). E. J. Gornowski and K. J. Nelson, assrs to Standard Oil Development Co. Gasification of carbonaceous solids.

U.S.P. 2,633,475 (10.1.50; 31.3.53). H. O. Mottern, assr to Standard Oil Development Co. *sec*-Aliphatic alcohols are converted to ketones in the vapour phase using a cat comprising a group II metal oxide coated on lumps of fused zirconia.

U.S.P. 2,633,476 (4.3.52; 31.3.53). F. H. Seubold, assr to Shell Development Co. Aralkyl hydrocarbons are treated first with a strong mineral acid and then with an alkali metal prior to oxidn to hydroperoxides. J. M. S.

Metering and Control

2137. Vital statistics on infra-red analysers for automatic control. D. E. Berger. *Petrol. Engr*, May 1953, **25** (5), C26.—Discussion of the desirability of composition monitoring and control from the standpoint of plant operations, economic effects of inadequate composition control, desirable points for sampling, use of analysers for automatic control, methods of sample preparation, and presentation of analysis to operating personnel. The object is to decrease the time lag between sampling and the lab analysis, thus giving a more precise control of composition. Instrument payout times range from a year down to a few days. G. H. G.

2138. Design and construction of control valves. D. E. Hostedler. *Petrol. Refin.*, 1953, **32** (8), 133–4.—A critical analysis of the more important features in the design and construction of control valves. R. D. S.

2139. The case of the graphic panel. R. L. Nichols. *Petrol. Engr*, May 1953, **25** (5), C11–14.—Use of the control panel is traced from the early Cross-cracking units, various transmission systems allowing the control rooms to be isolated from the operating area. The graphic control panel is one presenting a simplified flow sheet of the process. Advantages and disadvantages of the centralized control panel are given; in the case of the graphic panel the disadvantage is the tendency to overdo it. G. H. G.

2140. Trends in refinery instrumentation. Pt 9. Selection, installation, and maintenance of pressure gauges. S. D. Ross and W. W. Drake. *Petrol. Engr*, April 1953, **25** (4), C44.—For optimum accuracy and sensitivity, normal working range should be between 40 and 60% of max range of gauge. To give greater accuracy and sensitivity in indicating, recording, and controlling, spiral, bellows, and similar type elements have been designed. Design and ranges of these instruments for bronze steel and stainless steel are given. Installation is as important as the selection of range and material of construction—details are given for installation of piping, placing gauge in operation to measure clean liq and gases, corrosive fluids, steam pressures, with correction of liq level in lines.

4 methods given to check calibration of pressure gauges are: (1) zero adjustment; (2) single point and zero check; (3) displacement or " dead weight " tester; (4) standard test gauge and regulated air supply. A further method is described for absolute pressure gauges. Notes are given on maintenance and testing of equipment.

G. H. G.

PRODUCTS

Chemistry and Physics

2141. Relation between number of carbon atoms and boiling temperature of sulphur compounds of petroleum. A. Girelli. *Riv. Combust.*, June 1953, **7**, (6), 392–7.—Boiling points of petroleum sulphur compounds of different series have been correlated by the empirical equation proposed by Egloff *et al* for aliphatic hydrocarbons.

The agreement between experimental and calculated values is reasonably good, taking into proper account the scarce reliability of some experimental data reported in the literature, for physical properties of organic sulphur compounds. (Author's Summary.)

2142. Dielectric properties of polyvinyl acetals. B. L. Funt and T. H. Sutherland. *Canad. J. Chem.*, 1952, **30**, 940–7.—The dielectric dispersion in polyvinyl acetal and formal was measured over the frequency range 0·050–100 kc/s at temp between 25° and 135° C. With increasing size of substituent group between the chains the dispersion range is shifted to lower temp at a given frequency. J. G.

2143. The viscometric detection of branching in polymers. I. Branching in GR-S as a function of conversion. L. H. Cragg and A. T. Brown. *Canad. J. Chem.*, 1952, **30**, 1033–43.—Visc measurements were made on the fractions obtained from samples at various stages of conversion in the emulsion-copolymerization of butadiene and styrene. Values of the intrinsic visc (η) and of the visc slope " constants " β and k' were determined. It was concluded that little branching occurred at low conversions, increasing markedly with increased conversion. Max branching occurred in the species of highest mol. wt. J. G.

2144. Kinetics of the reactions between *iso*propyl cumene and tertiary butyl cumene hydroperoxides and iron (II) in dilute aqueous solutions in the absence of oxygen. R. J. Orr and H. L. Williams. *Canad. J. Chem.*, 1952, **30**, 985–93.—The rates of reaction were measured at different temp and the activation energy calculated. The rates can be expressed as $k = 4{\cdot}0 \times 10^9\ e^{-10,800/RT}$ for *iso*propyl cumene hydroperoxide and $k = 1{\cdot}8 \times 10^9\ e^{-9,900/RT}$ for *tert*-butyl cumene hydroperoxide. J. G.

2145. Temperature independent factors of hydrogen abstraction reactions in the gas phase. S. Bywater and R. Roberts. *Canad. J. Chem.*, 1952, **30**, 773–8.—Temp independent factors for the gas-phase hydrogen abstraction reactions of hydrogen atoms and methyl radicals with hydrogen, methane, ethane, and *iso*butane are calculated. The calculated values, based on the theory of Eyring and co-workers, are compared with experimental values. The factors producing variation and sources of error are discussed. J. G.

2146. The mobility of oil droplets, interfacial tension measurements, and gegen ion adsorption in soap solutions. B. D. Powell and A. E. Alexander. *Canad. J. Chem.*, 1952, **30**, 1044–55.—The system studied was a Nujol in water emulsion stabilized by anion active sodium salts of sulphosuccinic esters. The electrophoretic mobility was measured using a micro-technique. The interfacial tension was measured by the drop volume method. The fraction of gegen ions adhering to the droplet was calculated and found to be of the order of 0·9 in all cases. J. G.

2147. Fundamental problems in the contemporary theory of homogeneous combustion of homogeneous gas systems. N. N. Semenov. *Izvest. Akad. Nauk. S.S.S.R., Otdel. Tekh. Nauk*, 1953, 708–29.—Review, under the following heads : auto-ignition, chain auto-ignition, normal rate of flame propagation, limits of flame propagation, rapid (turbulent) combustion, detonation. 30 refs. V. B.

2148. Chemiluminescent phenomena during hydrocarbon combustion. R. G. W. Norrish, G. Porter, and B. A. Thrush. *Nature, Lond.*, 1953, **172**, 71.—The light emission from homogeneously initiated explosions of acetylene and oxygen containing a

small amount of nitrogen peroxide as photosensitizer has been recorded as a function of time in a number of wavelength regions each covering about 40 Å. Radiation processes which are non-thermal have been detected. They appear not to be connected with the main reaction, do not bring about any appreciable permanent change either in temp or concn, and occur only for a relatively short time during the combustion process. H. C. E.

2149. Investigation of the instability of a moving liquid film. H. B. Squire. *J. appl. Phys.*, 1953, **4** (6), 167–9.—The stability of a thin liq layer moving in still air is studied theoretically to throw light on the break-up of films during atomization. Instability occurs if $W = T/d_1U^2h < 1$, and it has been found that the wavelength for max growth factor, for $W \ll 1$, $\pi\lambda = 4\pi T/d_2U^2$, where d_1 and d_2 are the densities of the liq and air, U is the film velocity, $2H$ is the film thickness, and T the surface tension of the liq. Comparison with experimental data shows fair agreement with observed wavelength. C. N. T.

Analysis and Testing

2150. Correlation of petroleum oil distillations. J. O. Francis and M. Van Winkle. *Petrol. Engr*, April 1953, **25** (4), C26.—10 petroleum oils and fractions were used to obtain the dist data. Trial and error established that a relationship between the 50% temp and a slope range increment of 10% gives best representation of data. Relationships are given between ASTM 50% temp and Bureau of Mines 50% for both stages of the dist. ASTM dist data can be calculated from B of M results by steps outlined. Data used in developing the correlation cover crude oils and petroleum oil fractions with even dist properties and K 10·5–12. Method does not apply to blends of highly fractionated cuts of different boiling ranges or highly aromatic fractions. G. H. G.

2151. Method for determination of tetra-ethyl lead in gasoline. W. S. Levine. *Petrol. Engr*, May 1953, **25** (5), C37.—A rapid analysis for the determination of T.E.L. is given, which can be made by non-technical operators with inexpensive equipment. The lead is determined colorimetrically using dithizone following its extraction from the gasoline. The pH value of the aq soln from which the lead is extracted by dithizone should be approx 9·3. Results obtained are not as precise as those by the polarographic method, but good enough for routine analysis. Theory, method, apparatus, reagents, and procedure are given. G. H. G.

2152. Determining T.E.L. in gasoline by flame photometry. J. H. Jordan. *Petrol. Refin.*, 1953, **32** (8), 139–40.—An account of the analytical procedure and the relative accuracy of photometric T.E.L. determinations which are rapidly performed and use relatively inexpensive equipment. R. D. S.

2153. Determination of *n*-paraffins in commercial petroleum waxes. H. Schindler and A. Kinsel. *Petrol. Engr*, April 1953, **25** (4), C66–7.—Determination of *n*-paraffins in gasoline, oils, and paraffin waxes is based on selective reaction of antimony pentachloride with hydrocarbons other than *n*-paraffins. Original method modified when dealing with commercial petroleum waxes by centrifuging to remove all suspended matter. Correlation of crystallinity index and *n*-paraffin content is given. Crystallinity index determines contraction of the wax on solidification under specified conditions. A straight line relationship exists for waxes containing more than 35% *n*-paraffins. G. H. G.

2154. Determination of asphalt content of a lub crude oil residuum. F. J. Higgins. *Petrol. Engr*, April 1953, **25** (4), C65–6.—Asphalt determined from colour of 3 or 4 naphtha solutions of a lub residuum which have been contacted with different quantities of Filtrol contact clay. Point is reached where additional clay has very little effect on the visc of the remaining oil. Colours of the oil–naphtha soln are observed at this point, the colour range being chosen to indicate this condition. From a plot of material removed *vs* colour of the oil soln, the asphalt is taken to be the material removed at a colour corresponding to 135 Klett colour. Time for one determination 8 hr.
G. H. G.

2155. Separating asphalt materials . . . *n*-butanol–acetone method. R. N. Traxler and H. E. Schewyer. *Oil Gas J.*, 31.8.53, **52** (17), 133.—This issue of the Refiner's Notebook describes a procedure employing solvent action of *n*-butanol and acetone to separate asphaltic materials into: (1) asphaltics; (2) paraffinic oils; and (3) cyclic oils. G. A. C.

2156. Structural analyses of gasoline fractions of petroleum. M. Killer, M. Slunjski, and V. Skaric. *Nafta (Yugoslavia)*, May 1953, **5**, 141–53.—Gasoline fractions of 5 crudes from the Petisovci field are analysed for aromatics, naphthenes, and paraffins by means of indirect methods of hydrocarbon type analysis, using refractivity intercept and specific dispersion, calculated from refractive index and density. The accuracy of the methods applied is checked by means of sulphuric acid–phosphor-pentoxide extraction and chromatographic techniques. (Authors' Summary.)

2157. Raman spectroscopy of low pressure gases and vapours. H. L. Welsh, M. F. Crawford, J. R. Thomas, and G. R. Love. *Canad. J. Phys.*, 1952, **30**, 577–96.—Raman spectra of CH_4, CH_3Cl, CH_2Cl_2, $CHCl_3$, CCl_4, and CH_3Br were measured using a carefully diaphragmed Raman tube of large volume and a pressure of a few atm. The light source consisted of 5 high intensity mercury lamps with watercooled electrodes. J. G.

2158. Note on the resolving power of mass spectrometers. L. Kernin. *Canad. J. Phys.*, 1952, **30**, 503–11.—The factors affecting the resolving power of homogeneous field mass spectrometers are discussed. Formulæ for the resolving power of 3 types of spectrometer are derived. J. G.

Gas

2159. Drying natural gas. R. J. Getty, C. E. Lamb, and W. C. Montgomery. *Oil Gas J.*, 17.8.53, **52** (15), 132.—Results are given of a 20 months field test on a new activated alumina gel dessicant in drying high-pressure gas at the Reddell separator station of Continental Oil Co., La. G. A. C.

2160. Patent. U.S.P. 2,625,518 (6.11.50; 13.1.53). H. B. Pollock, assr to California Research Corpn. Odorant for gaseous fuels, used in amount <2 lb/1,000,000 cu. ft. of gas, consisting of equal parts by wt of a volatile oil containing >2 wt % total sulphur, dist at 100°–400° F, produced by decomposing acid sludge, and tetrahydrothiophene. V. P. P.

Gas Oil and Fuel Oil

2161. Patents. U.S.P. 2,637,649 (2.9.49; 5.5.53). E. C. Handwerk, G. T. Mahler, and L. J. Held, assrs to New Jersey Zinc Co. The oxidn of zinc vapour during its condensation in the presence of a diluent gas is prevented by introducing a crackable hydrocarbon sufficient to produce a floating cloud of incandescent nascent carbon particles but insufficient to lower the temp below 800° C.

U.S.P. 2,639,227 (2.9.50; 19.5.53). E. B. Glendenning, C. Wies, and J. B. R. Caron, assrs to Shell Development Co. Fuel oils containing cracked components are prevented from clogging by adding from 0·0025 to 0·05% of an oil-sol calcium pet sulphonate and from 0·0015 to 0·0042% of an oil-sol calcium salt of an octylphenol-formaldehyde condensation product. J. M. S.

Lubricants

2162. British Standard for engine lubricating oils. Anon. *Petroleum, Lond.*, May 1953, **16** (5), 145.—New British Standard B.S. 1905: 1952, lays down standards for the quality and performance of additive-type oils for compression-ignition engines. This Standard involves use of American test engines, as no test using a British engine has been sufficiently widely examined. G. H. G.

2163. Static friction tests for special lubricants. Anon. *Petroleum, Lond.*, May 1953, **16** (5), 135–6.—The tests determined the ease with which one of a pair of lubricated metal surfaces would start to slide in relation to the opposing surface. 20 lubricants were used, principally chlorinated and fluorinated hydrocarbons, with and without additives. Metal surfaces were stainless steel, carbon steel, cast iron, aluminium alloy, and chromium plate.

Lowest static friction was shown by test lubricants containing molybdenum disulphide. Most favourable data were obtained by lubricants showing static friction 50–60% less than S.A.E. 10 reference oil. Higher friction shown by chlorinated and fluorinated lubricants without additives. Some of the metal combinations showed the same amount of friction independent of lubricant used, relative to other metal combinations. Methods of testing and results are given. G. H. G.

2164. Use of synthetic lubricants. Anon. *Petrol. Engr*, April 1953, **25** (4), C63.—Synthetic lubricating fluids used in compounding commercial lubricants are of two types: (*a*) those prepared as substitutes for natural mineral oils—largely hydrocarbon origin; (*b*) fluids developed to supplement natural products, due to superior characteristics of the synthetics. Various synthetics are named with specific properties and characteristics. G. H. G.

2165. Synthetic lubricants from ethylene. J. H. Boyd. *Petrol. Engr*, April 1953, **25** (4), C62.—Ethylene (95% purity), is polymerized in batch autoclaves using aluminium chloride (6% by weight of finished lub oil) as cat. Sequence for the polymerization is given, together with recovery of the oil, which, when blended with natural lub oils are used principally as aviation oils. G. H. G.

2166. Patents. U.S.P. 2,631,129 (2.6.49; 10.3.53). S. P. Waugh, assr to Tide Water Associated Oil Co. Cutting oil comprising a mineral lub oil or sulphurized lub oil, an oil-soluble sulphurized tall oil, and an oil-soluble metal salt of an alkyl *cyclo*aliphatic dithiophosphate.

U.S.P. 2,631,130 (28.10.49; 10.3.53). J. H. Bartlett and T. Cross, assrs to Standard Oil Development Co. Mineral oil additives comprise reaction products of sulphur and phosphorus or compounds thereof with esters of ether alcohols. The reaction products may be used in the form of their salts with metals of Groups I and II.

U.S.P. 2,631,131 (19.4.50; 10.3.53). S. P. Waugh, assr to Tide Water Associated Oil Co. Mineral oils containing a sulphurized esterified tall oil and an oil-soluble metal salt of an ester of thiophosphoric acid.

U.S.P. 2,631,132 (12.4.50; 10.3.53). J. P. McDermott, assr to Standard Oil Development Co. Mineral lub oil containing 0·01–2% wt of a compound of the formula $((ROOC)_nR'O)_2$ PS.S.S.SP $(OR'(COOR)_n)_2$, where R is an alkyl group of 4–18 carbon atoms, R′ is a saturated aliphatic hydrocarbon radical of 2 or 3 carbon atoms, and n is 1, 2, or 3.

U.S.P. 2,631,978 (13.5.49; 17.3.53). F. C. Bersworth. Wire drawing lubricant for beryllium-copper alloys comprising an aq soln of the di-sodium mono-cadmium salt of ethylenediamine tetra-acetic and an alkali metal fatty acid soap.

U.S.P. 2,632,347 (30.3.49; 24.3.53). L. W. Sproule and L. F. King, assrs to Standard Oil Development Co. Emulsifiable lub oil for metal rolling, comprising mineral lub oil, sodium naphthasulphonate, sodium naphthenate, sperm oil, and diethylene glycol.

U.S.P. 2,632,734 (24.6.50; 24.3.53). T. J. Nunn, J. W. Leach, and A. G. Rogers, assrs to Standard Oil Development Co. Emulsifiable metal-working lubricant comprising a mineral lub oil, lard oil, an alkali metal petroleum sulphonate, a long chain fatty acid ester of a polyhydric alcohol, and a calcium soap of a fatty acid.

U.S.P. 2,632,735 (1.3.51; 24.3.53). R. S. Hawley, assr to Standard Oil Development Co. Lub oil additives of the formula $Cl_3C.CO.S.(C_nH_{2n})COOR$, wherein n is 1, 2, 3, or 4 and R is a hydrocarbon radical.

U.S.P. 2,632,767 (29.12.48; 24.3.53). P. V. Smith and F. Knoth, assrs to Standard Oil Development Co. Complex phosphate ester synthetic lubricants.

U.S.P. 2,633,425 (16.9.50; 31.3.53). R. B. Thompson, assr to Universal Oil Products Co. 1-Hydroxy-4-amino- and 1 : 4-diamino-5 : 8-dihydronaphthalenes and 1-hydroxy-4-amino- and 1 : 4-diamino-5 : 6 : 7 : 8-tetrahydronaphthalenes are anti-oxidants.

U.S.P. 2,633, 471 (1.12.49; 31.3.53). E. Lieber and A. F. Cashman, assrs to Standard Oil Development Co. The pour point of waxy mineral oils is lowered by adding a material made by heating stearic acid at 500°–700° F for 4–10 hr in the presence of steel wool. J. M. S.

Bitumen, Asphalt, and Tar

2167. Asphalt for roofing materials. I. W. L. Nelson. *Oil Gas J.*, 31.8.53, **52** (17), 135.—This issue of "Questions on Technology" gives tables showing properties of asphalt saturants for roll roofing and of mopping asphalts for built-up roofing, together with ranges sold in each type. G. A. C.

2168. Trends in use of hot mix asphaltic concrete. W. F. Winters. *Rds & Str.*, 1953, **96** (7), 113.—After describing the nature of asphaltic concrete, the author traces its development from sand–asphalt mixes (sheet asphalt) through the Warren patents of "Warrenite" and "Bitulithic" to the present-day material. Reference is also made to the finer-graded material known as the "Topeka Mix." The great advantage of asphaltic concrete in which at least 50% of the aggregate is coarser than 10 mesh, is the high stability conferred by the use of these coarse materials. The manner of application and the advantages of asphaltic concrete are described. Great emphasis is placed upon the importance of designing mixtures to cope with the type of loading anticipated in practice. The principal methods employed are all described: the Hubbard–Field Method; the Triaxial Shear Method; the Hveem Method; and the Marshall Method. Of these the Marshall machine is interesting and useful because of its extreme simplicity. Finally, details of different jobs are given. R. H.

2169. Patents. U.S.P. 2,637,650 (G.B. 31.7.45; 5.5.53). L. C. Bradshaw, assr to International Bitumen Emulsions Ltd. Fibre board consisting of fibrous material and a polymerized and vulcanized binder of fatty acid pitch (I), modified with hard bitumen (II), the ratio of I to II being between 1 : 2·4 and 3·5 : 1.

U.S.P. 2,638,638 (4.4.50; 19.5.53). E. B. McBride, assr to Sloane-Blabon Corpn. Flexible felt base material comprising a sheet of felt saturated with bituminous material (I) and containing a higher concn of I adjacent to one face than the other, the portion of the sheet containing the lower concn of I also containing starch filling the pores between the fibres.

U.S.P. 2,638,823 (3.1.49; 19.5.53). J. C. Roediger, assr to Standard Oil Development Co. Asphalt pavement consisting of a water-impervious pavement foundation, a lower asphalt course consisting of a hard bitumen, mineral aggregate, and a bitumen wetting agent, and an upper asphalt course consisting of a softer bitumen and mineral aggregate.

U.S.P. 2,639,651 (19.4.46; 26.5.53). F. S. Scott, assr to Union Oil Co of California. Method of repairing asphalt roads which comprises breaking up the surface, applying a coating of a highly aromatic pet extract having a visc between 70 and 8000 S.S.U. at 100° F, a visc–gravity constant greater than 0·9, and a fl. pt. above 300° F, allowing to stand for at least 1 hr, and amalgamating by pressure. J. M. S.

Special Hydrocarbon Products

2170. Electrical insulated materials. L. Hartshorn. *Nature, Lond.*, 1953, **172**, 8–11.—A session on mineral oil drew attention to the fact that traces of impurities profoundly affect the electrical properties of mineral oil. Pure mineral oil has a power factor which is very small but is accurately measurable if stringent precautions are observed. Traces of moisture and esters increase the loss angle, and oxidn leads to acidity, sludge formation, increase in power factor, and a reduction of the voltage at which thermal instability occurs. Tests on oils which had been in service for periods of 1–24 years showed that acidity and conductivity are not co-related; variations in iron content had a marked effect. H. C. E.

Derived Chemical Products

2171. Petrochemicals expanding 14% annually. J. H. Boyd and C. A. Rackus. *Petrol. Engr*, April 1953, **25** (4), C3–8.—Production of chemicals from petroleum and natural gas hydrocarbons is only 1% of petroleum and natural gas produced. Petrochemical industry growing more rapidly than petroleum and natural gas industries. This interest shown by the increasing proportion of petroleum capital invested in processing facilities that has gone to petrochemical plants. Trend continues towards joint enterprises with petroleum, chemical, or rubber companies.

Aliphatic hydrocarbons are most important petrochemical raw material, while the output of aromatics is of importance to supplement coal aromatics for chemical use. Various products and outputs are given. G. H. G.

2172. How to handle petrochemical plant water wastes. C. O. Huntress. *Petrol. Process.*, 1953, **8** (7), 1045–7.—Because of the absence of any ground water or regular supply of river water at the petrochemical plant of National Petro-chemicals Corpn at Tuscola, Illinois, U.S.A., a 25-acre lake impounding 100 million gal of water was constructed on the plant site to supply the plant with 10 million gal/day of treated water for cooling tower make-up, boiler feed, and process purposes. Lime and a coagulant are used in the water treatment plant for selective calcium carbonate removal in a high-rate upflow sludge contact type treating unit.

Wastes from the various units present another problem. The principal wastes include: sulphuric acid, caustic, boiler blowdown, and domestic sewage, all of which add up to 3 million gal/day of wastes for treatment and disposal in a unit similar to that used in the treatment of the raw water. The solids from both waste and water treatment processes are pumped into sludge lagoons, where they are decanted and held for drying. J. W. H.

2173. Sulphur recovery practices in oil industry. R. A. Graff. *Petrol. Engr*, April 1953, **25** (4), C19.—At present 10% of the U.S. supply of sulphur is produced by the oil and gas industry. The earliest type of sulphur recovery unit was the partial combustion process involving the Claus oven. Low conversion yields are due to poor equilibrium conversion conditions. First advance was total reaction carried out in two separate steps. More recent advance uses firebrick-lined combustion chamber, followed by cooling the gases in the waste heat boiler. This involves less equipment, but is limited to H_2S-bearing gases containing only small quantities of hydrocarbons. Modification consists of eliminating the cat converter following the reaction in the combustion chamber, condensing the sulphur, followed by reheating gas from the S condenser and passing to second stage cat reactor. Overall recovery 92%. To condense and collect liq sulphur use either the air-cooled system or the contact cooler–scrubber arrangement, where liquid S is used to desuperheat, condense, and scrub droplets from gas stream.

When H_2S gas stream will not burn satisfactorily, produce SO_2 by burning a portion of the sulphur produced, and mix this SO_2 with the main gas stream prior to entering the cat reactor. Another method involves the addition of sufficient hydrocarbon fuel gas to one-third portion of the H_2S-bearing gas stream. G. H. G.

2174. Patents. U.S.P. 2,625,463 (27.4.46; 13.1.53). C. L. Norton, assr to Babcock and Wilcox Co. Air is passed through a stream of hot inert refractory material descending from an upper heating chamber, the oxygen component of the heated gas being used for combustion of fuel to supply the heat for the process and the nitrogen component being reacted with hydrocarbon gas to produce hydrogen cyanide.

U.S.P. 2,625,554 (1.7.49; 13.1.53). J. R. Darby, assr to Monsanto Chemical Co. Preparation of maleic anhydride by passing a mixture of benzene and oxygen through a bed of cat particles comprising a porous inert carrier of finely divided silica bonded together by finely divided particles of a refractory glass low in basic constituents, the carrier being impregnated with a cat active material containing vanadium. The particles of the bed are of a size to be retained by a 6-mesh screen, $<50\%$ passing a 4-mesh screen.

U.S.P. 2,625,555 (8.10.47; 13.1.53). R. J. Miller, assr to California Research Corpn. Preparation of aryl tetracarboxylic acid anhydrides by oxidizing durene in a durene-

rich fraction separated from the product obtained by aromatizing $C_{<6}$ non-aromatic hydrocarbons.

U.S.P. 2,626,282 (5.10.49; 20.1.53). M. E. Cunningham and L. K. Beach, assrs to Standard Oil Development Co. Continuous process for production of β-methylmercaptopropionaldehyde (an intermediate in the production of methionine) which comprises oxidizing propylene with air in the presence of a cat (silica gel impregnated with a copper compound) and reacting the cooled effluent vapours containing acrolein with gaseous methyl mercaptan at 40°–60° C.

U.S.P. 2,626,277 (15.10.48; 20.1.53). S. R. Merley and A. Kofoet, assrs to Cities Service Research and Development Co. Oxidn of liq paraffin wax by air blowing at >290° F in presence of 0·1–10% of cumene hydroperoxide, based on wt of wax, to reduce the induction period.

U.S.P. 2,625,519 (7.3.50; 13.1.53). M. J. P. Hartig, assr to E. I. du Pont de Nemours and Co. Cat *A* for vap phase oxidn consists of molybdenum oxide combined with a basic oxide of cobalt and/or nickel *B* (basic metal : Mo = 0·90–0·62 : 1) and an acidic promoter which is an oxide of boron, phosphorus, or vanadium in amount 0·1–15% (calc on wt of the element) of *A*. *B* is precipitated from an aq medium containing Mo as molybdate stoichiometrically in excess of the basic metal.

U.S.P. 2,626,281 (23.8.49; 20.1.53). G. G. Joris, assr to Allied Chemical and Dye Corpn. Decomposition of aralkyl α-hydroperoxides to a carbonyl compound and a hydroxy aromatic compound is cat by contacting in liquid phase with sulphur dioxide.

U.S.P. 2,626,961 and 2,626,964 ((*a*) 30.3.49, (*b*) 22.12.48; 27.1.53). K. C. Eberly and R. J. Reid, assr to Firestone Tire and Rubber Co. (*a*) The new compound 1 : 2 : 5 : 6-tetrachloro-1 : 5-*cyclo*-octadiene (m.p. 99°–100° C) is prepared by heating 2 : 3-dichloro-1 : 3-butadiene *A* at 60° C under reflux in presence of a polymerization inhibitor. (*b*) *A* is produced by refluxing 1 : 2 : 3 : 4-tetrachlorobutane with lime slurry until the temp of a partially segregated zone of the vapours closely approaches 81° C and collecting the condensate formed at this temp.

U.S.P. 2,626,962 (17.5.49; 27.1.53). L. Schmerling, assr to Universal Oil Products Co. A saturated $C_{<3}$ halohydrocarbon is reacted with an acetylenic compound at −30° to +100° C in presence of a Friedel–Crafts cat to produce a halo-olefin of mol. wt. ≤ sum of mol. wt. of reactants.

U.S.P. 2,626,963 (6.1.51; 27.1.53). J. W. Clark, assr to Union Carbide and Carbon Corpn. Production of vinyl fluoride by briefly contacting a mixture of HF and acetylene at >100° C with cuprous cyanide deposited on a porous inert solid.

U.S.P. 2,626,965 (18.10.49; 27.1.53). P. A. Wiseman, assr to Firestone Tire and Rubber Co. Production of 1 : 2 : 2 : 3 : 3 : 4-hexachlorobutane by passing chlorine into undissolved 2 : 3-dichloro-1 : 3-butadiene at *ca* 10° C until 1 mol has been added and then at a higher temp but below refluxing temp until a second mol has been added.

U.S.P. 2,626,284 (17.9.49; 20.1.53). W. M. Smith, assr to Standard Oil Development Co. Crude *iso*-octyl alcohol produced by the OXO reaction followed by hydrogenation containing, as impurities, sulphur compounds, acids, esters, and especially formic acid esters, is contacted at least once prior to dist with aq 5–25% alkali metal hydroxide soln at 175–400° F, the mixture allowed to stratify, and the alcohol layer washed with water and dist.

U.S.P. 2,624,699 (28.9.51; 6.1.53). G. G. Joris, assr to Allied Chemical and Dye Corpn. Aldehydic impurities are removed from acetone by treating with activated carbon, graphite, diatomaceous earth, asbestos, pumice, coke, magnesia, or a sulphonated phenol–formaldehyde anion exchange resin, impregnated with an alkali metal hydroxide.

U.S.P. 2,626,279 (9.9.49; 20.1.53). W. W. Crouch, R. T. Werkman, and R. J. Fanning, assrs to Phillips Petroleum Co. Preparation of thiol esters, *e.g.*, butane-1 : 2-dithiolacetate, by reacting a monothiocarboxylic acid and a $C_{>12}$ diolefin of formula RRC=CH—CH=CRR, wherein each R is H, alkyl, *cyclo*alkyl, or aryl, and recovering an alkenyl thiolester resulting from 1 : 4-addition of 1 mol of acid to 1 mol of hydrocarbon and dithiolester addition products of 1 mol of acid and 1 mol of alkenyl thiolester.

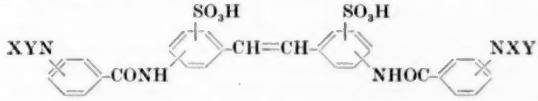
U.S.P. 2,624,742 (23.8.47; 6.1.53). C. B. Linn, assr to Universal Oil Products Co. C_{9-18} alkyl thiophene sulphonate detergent.

U.S.P. 2,625,513 (22.11.49; 13.1.53). H. G. Kirschenbauer, assr to Colgate–Palmolive–Peet Co. Non-caking, free-flowing, non-abrasive detergent composition *A* comprising a granular org detergent mixed with a synthetic hydrated magnesium silicate powder ($MgO : SiO_2 = 1 : 2$ to 3) in amount up to *ca* 20 wt % of *A*.

U.S.P. 2,625,514 (24.12.49; 13.1.53). H. G. Kirschenbauer, assr to Colgate–Palmolive–Peet Co. Non-caking abrasive detergent composition consisting essentially of a water-insoluble siliceous abrasive material, up to 15 wt % soap and up to 20 wt % of a synthetic hydrated magnesium trisilicate, sufficient to minimize caking.

U.S.P. 2,626,900 (29.1.49; 27.1.53). S. A. Russell, assr to Allied Chemical and Dye Corpn. Detergent composition consisting of 1 part by wt of "polypropylene" benzene sodium sulphonate, in which the "polypropylene" radicals contain an average of 13 to 15 carbon atoms and comprise a substantial proportion of "pentapropylene" radicals, 1–3 parts sodium sulphate and $\frac{1}{9}$–4 parts of $Na_4P_2O_7$.

U.S.P. 2,624,710 (G.B. 12.4.45; 6.1.53). R. Thomas, assr to Lever Brothers Co. Composition for laundering textiles and for imparting a whitening effect thereto comprising a detergent and 0·001–1 wt % of an aminoaroylamino stilbene sulphonic acid of the general formula



where X = aroyl or acyl radical; Y = H, $C_{>4}$ alkyl, phenyl, methylphenyl, or dimethyl-phenyl radical.

U.S.P. 2,626,244 (12.6.48; 20.1.53). W. A. Fessler, assr to Allied Chemical and Dye Corpn. Surface active composition consisting of: (1) a major proportion of salts of acids obtained by reacting a C_{10-30} organic compound having $\leqslant 1$ ethylenic linkage with a nitrosating agent and reacting the product with a sulphite, which acids include sulphonated-ketones, -amines, -alkylidene sulphamates *A*, -sulphamates and bisulphite adducts of *A*; (2) a minor proportion of a cation active compound having 1 nitrogen atom to which is attached an open C–C chain of 6–14 atoms and a group of $\geqslant 6$ C atoms, the total number of C atoms being $\geqslant 20$, to enhance the surface activity of (1).

U.S.P. 2,626,861 (France 6.9.46; 27.1.53). J. L. M. Frejacques, assr to Pechinery Compagnie de Produits Chimiques et Electrometallurgiques. Preparation of pyrotechnical compositions *A* by adding a hot saturated soln of potassium chlorate to a minor amount of a surface active compound, *e.g.*, sulphonated naphthalene and alkyl naphthalenes, sulphonated fatty alcohols, sulphonated paraffins, and alkali metal salts thereof, allowing the chlorate to crystallize and incorporating the crystals in *A*.

V. P. P.

U.S.P. 2,630,411 (16.7.49; 3.3.53). J. C. Harris, assr to Monsanto Chemical Co. Mixture of alkylbenzene sodium sulphonates consisting of 60–70 wt % of alkylbenzene sodium sulphonate, the alkyl group of which is derived from a propylene polymer fraction boiling over the range 118°–142° C and 40–30 wt % of alkylbenzene sodium sulphonate, the alkyl group of which is derived from a propylene polymer fraction boiling over the range 175°–225° C.

U.S.P. 2,630,448 (28.11.49; 3.3.53). W. W. Crouch and R. T. Werkman, assrs to Phillips Petroleum Co. 2-Cyanoethyl thiolacetate.

U.S.P. 2,630,450 (17.10.49; 3.3.53). D. Harman and A. R. Stiles, assrs to Shell Development Co. Tetraesters of thiodiphosphonic acid.

U.S.P. 2,630,452 (28.11.49; 3.3.53). W. W. Crouch and K. T. Werkman, assrs to Phillips Petroleum Co. β-Mercaptopropionitrile.

U.S.P. 2,631,174 (2.10.50; 10.3.53). V. N. Ipatieff and H. Pines, assrs to Universal Oil Products Co. 1-*p*-Tolyl-1-(2-methyl-5-*cyclo*hexylphenyl)-*cyclo*hexane.

U.S.P. 2,631,980 (22.7.49; 17.3.53). A. H. Lewis, assr to California Research Corpn. Non-caking detergent composition prepared by spray drying an aq slurring containing 20–40 % wt active detergent material, consisting of 10–30% wt of an alkyl sulphate containing 8–12 carbon atoms and 70–90% wt of a monoalkyl benzene sulphonate, the alkyl group being a polypropylene group of 12–15 carbon atoms, and 60–80% wt inorganic builders.

U.S.P. 2,632,011 (20.3.48; 17.3.53). H. de V. Finch and S. A. Ballard, assrs to Shell Development Co. Tetrahydrophthalic acid compounds.

U.S.P. 2,632,029 (25.7.50; 17.3.53). F. E. Condon, assr to Phillips Petroleum Co. Tertiary alkyl monohalides stabilized with an anhydrous carbonate of an alkali metal.

U.S.P. 2,632,756 (15.10.49; 24.3.53). D. Harman and A. R. Stiles, assrs to Shell Development Co. Olefinic tetraesters of bis (phosphonoalkyl) ethers.

U.S.P. 2,633,473 (7.1.48; 31.3.53). W. M. Bruner, assr to E. I. du Pont de Nemours and Co. Sodium sulphate of a highly branched primary heptadecanol made by the OXO process from tetra*iso*butylene.

U.S.P. 2,639,297 (30.8.46; 19.5.53). R. R. Whetstone and S. A. Ballard, assrs to Shell Development Co. 2-Hydroxy-1 : 6-hexanedial. J. M. S.

Coal, Shale, and Peat

2175. Patents. U.S.P. 2,624,696 (8.10.49; 6.1.53). A. H. Schutte, assr to Lummus Co. Continuous process for low temp carbonization of coal which comprises introducing hot granular coke, coal particles, and oil into a turbulent mixing zone in which the coal is rapidly heated to and through its plastic state and then passing the mixture downwardly as an unagitated gravity, packed column through a reaction zone maintained at 1000°–1400° F to convert coal and oil to vapours and non-agglomerating particles of dry coke which are removed by a controlled gravity flow, reheated, and recycled.

U.S.P. 2,624,698 (8.9.47; 6.1.53). J. H. Hickey, assr to Great Lakes Carbon Corpn. Purified coke suitable for carbon electrode manufacture is made by crushing to fine particles a bituminous coal, separating mineral impurities by physical methods and heating the particles with a volatile fluoride to a temp above its vaporizing temp (>100° C), but below temp at which the coal becomes plastic, to remove silicon impurities as volatile silicon fluorides, and finally coking the purified particles, thereby coalescing them. V. P. P.

Miscellaneous Products

2176. Lithium greases. H. C. Meyer, Jr. *Petrol. Engr*, May 1953, **25** (5), C15.—The prime reason for the increasing demand for lithium greases is their multi-purpose characteristics. No standard formulation for compounding a lithium grease is used. Within reasonable limitations, choice of base oils used will depend on economic considerations. With additives, those to which the base oil is sensitive may also be used effectively in conjunction with that oil when it is compounded into a grease. The exception is in the case with extreme pressure additives. The basic manufacturing procedures on lithium greases do not vary greatly from other types. Unit operations involved are : (1) compounding ; (2) cooling ; (3) milling. G. H. G.

2177. Petrochemicals unlimited. G. Egloff. *Petrol. Engr*, May 1953, **25** (5), C5.—At present, petrochemicals account for 25% of total chemical production. Max requirements for 25 years hence could be met by utilizing 3–4% of anticipated oil and gas production. Various plastics, synthetic rubbers, fibres, fertilizers, etc., are discussed, and present and future markets considered. The position of the refiner with regard to the production of the petrochemicals is considered. G. H. G.

2178. Patents. U.S.P. 2,630,415 (15.10.48; 3.3.53). H. L. Gerhart, assr to Pittsburgh Plate Glass Co. Copolymer of a mixture of a glyceride drying oil, *cyclo*pentadiene, and a cyclic terpenolene or a terpene hydrocarbon.

U.S.P. 2,630,417 (30.6.53; 3.3.53). J. F. Lontz, assr to E. I. du Pont de Nemours and Co. Pressure-coalescing composition comprising tetrafluoroethylene polymer particles mixed with a nuclear-chlorinated aromatic compound having a m.p. of −20° to 150° C and a b.p. <450° C.

U.S.P. 2,630,413 (24.1.52; 3.3.53). J. Dozzi, assr to Monsanto Chemical Co. Polyvinyl halides plasticized with a phenyl or tolyl [(1 : 2-dicarboalkoxy) ethyl] octadecenoate.

U.S.P. 2,630,420 (26.11.49; 3.3.53). C. E. Gleim, assr to Wingfoot Corpn. Adhesive comprising a butadiene–acrylonitrile copolymer and a phenol–formaldehyde–aniline resin.

U.S.P. 2,630,430 (5.4.48; 3.3.53). E. C. Shokal and P. A. Devlin, assrs to Shell Development Co. Copolymer of allyl alcohol and styrene containing 30–80% of combined styrene.

U.S.P. 2,630,438 (16.12.50; 3.3.53). R. H. Rosenwald, assr to Universal Oil Products Co. Drying oil containing a compound of the formula $\begin{matrix} R_1 \\ R_2 \end{matrix}\!\!>\!Ar\!<\!\begin{matrix} N \\ N \end{matrix}\!\!>\!O_n$, wherein Ar is an aromatic radical, n is 1 or 2, and R_1 and R_2 are hydrogen, alkyl, aryl, aralkyl, nitro, halogen, alkoxy, or hydroxy.

U.S.P. 2,630,686 (13.3.51; 10.3.53). W. H. Reed and W. A. Pennington, assrs to Carrier Corpn. Mixture of *sym*-dichlorotetrafluoroethane and monofluorodichloromethane is used as a refrigerant in systems employing a positive displacement compressor.

U.S.P. 2,631,138 (26.2.51; 10.3.53). H. Dannenberg, assr to Shell Development Co. Mixtures of a glycidyl polyether of a dihydric phenol and an alkylated urea–formaldehyde condensate are cured in the presence of a hydrocarbon sulphonic acid or sulphonyl halide.

U.S.P. 2,631,139 (4.12.45; 10.3.53). M. H. Mahan, assr to Standard Oil Development Co. Synthetic rubber made of butadiene and acrylonitrile is plasticized with a styrene–*iso*butylene copolymer.

U.S.P. 2,631,140 (19.7.51; 10.3.53). H. S. Bloch, assr to Universal Oil Products Co. Phenolic resins made from a condensation product of a phenol with a mixture of cyclic polyolefinic hydrocarbons having conjugated and non-conjugated unsaturation in the same mol, by reaction with an aldehyde or ketone in the presence of a basic condensation cat.

U.S.P. 2,631,953 (12.3.49; 17.3.53). A. W. Hubbard and W. C. Smith, assrs to Standard Oil Development Co. *iso*-Olefin–diolefin copolymers are attached to metal by an *iso*-olefin–styrene–diolefine copolymer and a natural rubber tie ply.

U.S.P. 2,632,745 (8.7.49; 24.3.53). H. G. Smith, T. L. Cantrell, and M. L. Hill, assrs to Gulf Oil Corpn. Composition comprising a higher fatty alcohol and a metal salt of a condensation product of a monoalkyl phenol, formaldehyde, and a fatty acid.

U.S.P. 2,632,746–7 (28.3.53; 24.3.53). J. E. Darby, assr to Monsanto Chemical Co. Fungi- and bacteria-resistant polyvinyl halide compositions containing a plasticizer, an arylsulphonamide–formaldehyde condensation product, copper 8-quinolinolate, and cadmium or calcium ricinoleate.

U.S.P. 2,632,754 (5.12.47; 24.3.53). H. E. Albert, assr to Firestone Tire and Rubber Co. Synthetic rubbers stabilized by a stannous amine complex obtained by rendering alkaline a soln of an aromatic amine and a stannous salt of a strong acid.

U.S.P. 2,633,458 (17.11.51; 31.3.53). E. C. Shokal, assr to Shell Development Co. Resinous products obtained by reacting a polyepoxide with hydrogen sulphide.

U.S.P. 2,637,664 (23.6.49; 5.5.53). J. F. Howe, assr to Phillips Petroleum Co. A latex of a 1-butene–sulphur dioxide resin is treated with sodium hydroxide to raise the pH to between 4 and 8, the latex is coated on to an article which is then dried at 150°–210° F and subsequently heated at 230°–275° F for 1 minute to 1 hr.

U.S.P. 2,637,710 (26.6.48; 5.5.53). G. E. Hulse, assr to Hercules Powder Co. Adhesive comprising a copolymer of methyl *iso*propenyl ketone and butadiene and a resin tackifier.

U.S.P. 2,637,714 (26.5.51; 5.5.53). W. S. Emerson and R. I. Longley, assrs to Monsanto Chemical Co. Polyvinyl halides are plasticized with a mixture of esters made by condensing diethylene glycol with a mixture of acids consisting of an aliphatic mono-olefinic acid of 10–20 carbon atoms and benzoic or a toluic acid.

U.S.P. 2,638,421 (France 15.4.48; 12.5.53). J. P. J. Serres. Particles of wood agglomerated with a mixture of a liq hydrocarbon and thiophene or an alkyl thiophene.

U.S.P. 2,638,460 (2.1.51; 12.5.53). W. W. Crouch, assr to Phillips Petroleum Co. Liq polymers of 1 : 3-butadiene or 2-methyl-1 : 3-butadiene are mixed with natural or synthetic rubber.

U.S.P. 2,638,461 (2.1.51; 12.5.53). W. M. St. John, assr to Phillips Petroleum Co. Liq polymers prepared from dienes of the formula $CH_2{:}CXCX{:}CXCH_3$, wherein each X is hydrogen or a methyl group are mixed with natural or synthetic rubber.

U.S.P. 2,640,037 (3.10.51; 26.5.53). H. L. Parry and Q. T. Wiles, assrs to Shell Development Co. Fatty acid salts of sol fusible reaction products of a glycidyl polyether of a dihydric phenol with a *sec*-amine.

U.S.P. 2,640,042 (6.11.51; 26.5.53). L. H. Howland and V. S. Chambers, assrs to United States Rubber Co. Synthetic rubber composition comprising 25–75 parts of carbon black per 100 parts of synthetic rubber, the latter being an aq emulsion polymerizate of a mixture of 97–99·5 parts of butadiene and 3–0·5 parts of monovinyl pyridine or a mono- or di-alkyl monovinyl pyridine. J. M. S.

CORROSION

2179. Organic inhibitor controls refinery corrosion. C. C. Hulbert and J. A. Rippetoe. *Oil Gas J.*, 17.8. 53, **52** (15), 120.—2 years' experience on an organic corrosion inhibitor is reported by Pure Oil Co. The inhibitor was a hydrocarbon-soluble high boiling stable substance of sp. gr. near 1·0, pour point −50° F, and a S.U. visc of 44 sec at 100° F.

Applied in a crude fractionating unit, it was found that less maintenance was required and life expectancy of equipment was 20–60% higher than with inhibitor. Inhibitor should be injected continuously and pH controlled within the range 7·5–8·0.

G. A. C.

2180. Corrosion control in cooling water systems. W. A. Tanzola. *Petrol. Engr*, April 1953, **25** (4), C57–60.—Describes dianodic method. Polyphosphates and chromates are anodic inhibitors, and combination at relatively low concn and under controlled conditions of pH will reduce pitting to minor fraction of that produced when materials are used separately. Treatment is also effective with non-ferrous metals. pH 6 is necessary (approx). Suspended matter may impart marked corrosion, and filtering of the make-up water is economically advisable. Where dust, lint, fibre, etc, constitute the foreign matter, a side stream filter should be considered. Formula is given to calculate size of side stream filter. Cost of units is justified where excessive quantities of treatment are required to stifle attack due to suspended or foreign matter.

G. H. G.

2181. Corrosion control. Anon. *Gas Oil J.*, 10.8.53, **52** (14), 133; 17.8.53, **52** (15), 55.—This part deals with the control of corrosion by application of coal-tar and asphalt coatings. Coating machines and a holiday detector for locating small faults are depicted.

A third general method is discussed by which corrosion can be controlled along a pipeline. This consists in forcing a current to flow on to the pipe at selected points or throughout its length.

Magnesium anodes and their installation are dealt with. G. A. C.

2182. Patents. U.S.P. 2,625,511 (30.11.48; 13.1.53). A. G. Rocchini, assr to Gulf Research and Development Co. Anti-corrosion composition comprising a hydrocarbon oil and a minor amount of an amide or imide of a succinic acid having an alkylthio or arythio substituent in the aliphatic chain, and an amine.

U.S.P. 2,624,706 (23.10.48; 6.1.53). W. J. Maxey and H. L. Sanders, assrs to General Aniline and Film Corpn. Non-corrosive fire extinguishing composition con-

sisting essentially of water having dissolved therein from 1 to 10 parts of sodium nitrite per 10 parts of an alkylated phenol–ethylene oxide wetting agent.

U.S.P. 2,624,708 (23.6.50; 6.1.53). T. W. Langer and B. F. Mago, assrs to Union Carbide and Carbon Corpn. Corrosion by aq fluids containing a monohydroxy oxyethylene-oxy-1 : 2-propylene butyl monoether is inhibited by incorporating a mixture of 0·5–5 wt % of dilinoleic acid, 0·5–5 wt % of tri-*iso*propanolamine, and 0·05–0·5 wt % of mercaptobenzthiazole. V. P. P.

U.S.P. 2,637,703 (8.3.51; 5.5.53). T. W. Dixon and N. W. Sproule, assrs to Standard Oil Development Co. Rust-inhibiting compositions comprising an aromatic-free mineral oil, 15–30% wt oil-sol sodium pet sulphonate, 0·75–1·5% wt ethyleneglycol monobutylether, and 2–4% wt pentaerythritol mono-oleate. The last ingredient may be replaced by a mixture of sorbitan monolaurate and mono-oleate.

U.S.P. 2,638,449 (30.12.49; 12.5.53). R. V. White and H. D. Norris, assrs to Socony-Vacuum Oil Co. Corrosion-inhibiting composition comprising a neutral vehicle containing a product made by reacting a fatty acid with a dialkanolamine and reacting this intermediate product with an alkenyl succinic anhydride.

U.S.P. 2,638,450 (17.1.50; 12.5.53). R. V. White and P. S. Landis, assrs to Socony-Vacuum Oil Co. Corrosion-inhibiting composition comprising a neutral vehicle containing a product made by reacting an alkyl monohalide with a polyalkylenepolyamine and reacting this intermediate product with an alkenyl succinic anhydride.

U.S.P. 2,639,971 (29.1.49; 26.5.53). A. C. Broyles, assr to Standard Oil Development Co. Storage tank corrosion is reduced by maintaining in the vapour space nitromethane, nitroethane, or nitropropane.

U.S.P. 2,640,029 (23.5.51; 26.5.53). C. M. Blair and W. F. Gross, assrs to Petrolite Corpn. Corrosion of metals is prevented by applying to them certain substituted tetrahydropyrimidines. J. M. S.

Engines and Automotive Equipment

2183. Petter 1½ b.h.p. design [diesel engine]. Anon. *Gas Oil Pwr*, 1953, **48**, 171.—This PAZl type 4-stroke engine has a single cyl of bore and stroke each 3 inches and develops 1½–2½ b.h.p. at 1000–1500 r.p.m. Fuel is injected directly into an offset hemispherical combustion chamber in the Al-alloy piston, which carries 3 compression and 2 slotted scraper rings. The bearings and rocker gears are pressure-lubricated by a plunger pump; the cyl walls and camshaft are splash-lubricated. The engine is air-cooled, and its overall weight is 230 lb. H. C. E.

2184. Pametrada report for 1952. Anon. *Gas Oil Pwr*, 1953, **48**, 179.—This synopsis of the 1952 report deals mainly with tests on a 3500-s.h.p. unit. After 100 hr continuous running defects in the blading of the L.P. turbine rotor and in the heat exchanger were found and remedied. Experiments were made with magnesium acetate and magnesium sulphate as additives, but the H.P. turbine rapidly became fouled. H. C. E.

2185. R.N. Husky [diesel engine]. Anon. *Gas Oil Pwr*, 1953, **48**, 166.—This engine has a single cyl of bore and stroke 3¾ and 4½ inches respectively. It provides 5–8 b.h.p. at speeds of 1000–1500 r.p.m., with corresponding b.m.e.p.s of 80 and 85 p.s.i. Fuel consumption at full load is 0·44 lb/b.h.p.hr.

The Al–Si alloy piston carries 3 compression and 2 scraper rings. The cyl head contains a clerestory combustion chamber which promotes turbulence, and the inlet and exhaust valves are arranged horizontally. Engine lubrication is provided by a gear pump which passes lub oil through a filter before it is delivered to the bearings and valve gear. Engine cooling is by thermo-syphon in conjunction with either cooling tanks or radiator. The dry weight of the engine, with single flywheel, is 500 lb. H. C. E.

2186. Testing Admiralty gas turbines. Anon. *Gas Oil Pwr*, 1953, **48**, 176–8.—Description of a new test house at Farnborough capable of testing gas turbines intended

for main propulsion up to 10,000 s.h.p. under conditions approximating to service conditions.

The fuel supply is contained in two 10,000-gal tanks, with provision for heating to 120° F. Centrifuges and other heaters are provided, and the system is designed to supply up to 1000 gal/hr of clean fuel at 20 p.s.i. and a suitable temp to the suction side of the unit under test. Units can also be started on light oil and subsequently switched to heavy fuel.

Up to 15,000 gal/hr of lub oil at 36 p.s.i. can be passed to the unit under test.

H. C. E.

2187. Diesel-electric shunters for British Railways. Anon. *Gas Oil Pwr*, 1953, **48**, 159–60, 163.—These locomotives are powered by an English Electric 6KT engine having 6 cyl of bore 10 inches and stroke 12 inches, giving a max output of 400 b.h.p. at 680 r.p.m. They are fitted with wet type liners and wet sump with hand-operated lub oil priming pump. Exhaust gases are water-cooled, and the air, fuel oil, and lub oil are filtered. The main generator, directly coupled to the diesel engine, is a separately-excited D.C. unit with a rating of 441 amp at 430 V. The auxiliary generator, driven from the main shaft, is rated at 13·5 kW at 90 V, and provides current for battery charging, lighting, compressor motors, etc. The 2 traction motors are mounted on the leading and trailing axles, with gearing to give a reduction of 23·9 : 1 to the wheels.

Frame and superstructure details, the control gear, and the braking arrangements are described. H. C. E.

2188. Diesel starting sets for Comet airliners. Anon. *Gas Oil Pwr*, 1953, **48**, 164.—These portable units comprise a Leyland diesel engine and 2 generators.

The vertical engine has 6 cyl of dimensions 5 inches bore and 7·5 inches stroke, and is directly coupled to 2 generators of outputs 450 amp at 112 V, and 750 amp at 28 V. Peak starting currents are 850 and 2000 amp respectively. The equipment includes 2 batteries giving 24 V and 96 V.

The control gear and safety devices are described. H. C. E.

2189. The Mirrlees supercharged marine engine. Anon. *Mot. Ship*, Aug. 1953, **34** (401), 210.—A description, with illustrations and diagrams, is given of a K-type propelling engine now on shop tests at Stockport. It is a 6-cyl supercharged direct-reversing unit with a 12-hr rating of 955 s.h.p. at 250 r.p.m. U. M.

2190. First German-built Fiat engine. Anon. *Mot. Ship*, Aug. 1953, **34** (401), 206.—The paper describes a Börsig–Fiat unit designed to run at 125 r.p.m. for an output of 3600 b.h.p. It is of single-acting 2-stroke type with 6 cyl 680 mm dia and piston stroke 1200 mm. Designed to run on boiler oil, the engine is arranged to operate with slight supercharge of the scavenging air through automatic after-charging valves. A special feature is the lubrication of the running gear without boring the crankshaft for the delivery of the oil. Test results and diagrams are included. U. M.

2191. Multi-diesel propulsion for large tankers. R. E. Reyner. *Mot. Ship*, Aug. 1953, **34** (401), 202.—Geared diesel engines are compared with other classes of machinery for the propulsion of large tankers, and a proposed 8-engine 13,000-s.h.p. machinery arrangement for a 25,000-ton tanker is described and illustrated. U. M.

2192. Problem of combustion phases in a prime mover. A. S. Sokolik, A. N. Voinov, and Yu. B. Sviridov. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1953, 783–6.—Polemical. A reply to the previous discussion (see Abs. 1667 of 1953). V. B.

Miscellaneous

2193. How petroleum hydrocarbons are named. M. Alexander. *Oil Gas J.*, 24.8.53, **52** (16), 124.—Recommendations in concise form are made for an orderly hydrocarbon nomenclature for the straight and branched-chain of hydrocarbons, olefins, acetylenes, and benzene and derivatives. G. A. C.

2194. The use and abuse of fuels. W. E. P. Johnson. *Petroleum, Lond.*, May 1953, **16** (5), 128–9.—Problem of depletion of world's fuel supplies and wastage of fuel is discussed. Coal and oil are the two fuels to consider on a short term view. Fuel oil consumption is 3–4% of coal consumption. Overall national cost of using fuel oil is far less than that of using coal. The prime duty is to economize on coal by all possible means. Other fuels discussed are peat, natural gas, and oxygen.

Main abuse of fuel is the inefficient use to which it is put, *e.g.*, wrong fuel for a given purpose, use of fuel where none should be used. The steam engine, widely used, still remains inefficient. Except for the gas turbine, no other invention combines the requirements for industrial use, therefore it is necessary to modify and refine the existing methods to avoid abusing fuel. G. H. G.

2195. The Fuel Research Board and oil problems. Anon. *Petrol. Times*, 4.9.53, **57** (1463), 897.—The 1952 report of the Fuel Research Board of the D.S.I.R. containing a chapter on oils and chemicals. This deals with progress of work on the Fischer–Tropsch plant; the investigation into flow properties of residual fuel oils; and a study of methods of separating emulsions of fuel oils and seawater.

These sections are discussed in this issue. G. A. C.

2196. Preventive maintenance of centrifugal pumps. F. B. Applegate. *Petrol. Engr*, May 1953, **25** (5), C32.—3 major destructive forces affect the performance of centifugal pumps: (1) erosion; (2) chemical action; (3) motion. The preventive maintenance project is made up of 7 major factors: first three, design, materials, and workmanship entering into construction of pump, limit chemical action to some degree, eliminate erosion, unnecessary rubbing contacts, leakage, and vibration; (4) selection of pump and materials of construction; (5) location of pump and design of piping; (6) care during installation, cleanliness essential; (7) care during operation and when idle. Use of correct maintenance records is stressed. G. H. G.

BOOK REVIEWS

Fuel Testing. 3rd Edn. G. W. Himus. London: Leonard Hill Ltd., 1953. Pp. xv + 278. 25*s*.

This book has for its sub-title "Laboratory Methods in Fuel Technology" and is largely concerned with the sampling and testing of coal, coke, semi-coke, and gaseous fuels derived therefrom. It is probably this part of the book which will appeal more to the petroleum technologist as a student of fuel technology than that which deals with the testing of liquid fuels. There are obvious reasons why a general knowledge of the methods of testing of this country's most important fuel should be accessible to the worker in the petroleum industry. It is not so long ago that the production of hydrogen for hydrogenation of petroleum fractions to aviation fuel components was dependent on the water-gas reaction, with the petroleum laboratory being required to control the quality of the raw material and the gaseous products of the reaction at all stages. As regards influence on design and availability of laboratory apparatus pertinent to the coal industry, it is probable that the petroleum industry in this country takes second place: for example, the design of the bomb calorimeter is more likely to be influenced by the coal industry, and it behoves the petroleum technologist to keep a careful watch on developments and to co-operate in all discussions on the standardization of apparatus and the methods of the other industry. For such reasons this book has a definite place in a petroleum library. It is a useful source-book in which the reader is acquainted with the basic methods of testing solid fuels, and where necessary he is referred to referee publications, notably the Standards of the British Standards Institution. It would have been useful if the author had included references to the corresponding methods used in America because the American Society of Testing Materials have produced Standards which have much in common with those in use in this country; particularly is ASTM method D271–48, Sampling and Analysis of Coal and Coke, worth comparison.

Only one chapter is directly concerned with the testing of petroleum products, Chapter XI, which is essentially a selection of the Institute of Petroleum's "Standard Methods." The drawback of reproducing the standard methods of an official body is inherent in all text-books that adopt this procedure—there is always the risk of the information being out of date. It would have been better if the details of the methods which were chosen had been reduced and a statement included to the effect that the current edition of IP "Standard Methods" should be consulted for revisions and for referee work. Thus, the method described for determining the kinematic viscosity of fuel oils in which the U-tube viscometer is illustrated may be sufficient for the student, but there have been considerable developments in absolute viscometry; there might well have been a reference to the suspended level viscometer which has been in use in many laboratories since 1942.

There is little of direct interest to the petroleum technologist in the field of gas analysis. The subject of light hydrocarbon analysis is not mentioned specifically in spite of the fact that liquefied petroleum gases are used as a fuel in this country. However, the two chapters on gas analysis and calorific value of gases are comprehensive, and the discussion of the analysis of combustion products is of interest to all industries operating boiler plant.

The first half of the book is essentially concerned with coal and coke; sampling, proximate analysis, ultimate analysis, carbonization assays, mineral matter, analysis of coal ash, and the fusion point of coal ash, with an intermediate chapter on the various methods for measuring or estimating calorific value. Apart from the three chapters on gas analysis, calorific value of gases, and tests on liquid fuels, respectively, the last three chapters are concerned with technical pyrometry, the selection of coal for industrial uses, and combustion calculations.

Chapter XIII includes a discussion on the preparation and writing of technical reports, from which it is inferred that this book is intended mainly for students.

G. W. D.

The Atomisation of Liquid Fuels. Prof E. Giffen and Dr A. Muraszew. London: Chapman and Hall Ltd. Pp. viii + 246. 36*s*.

Here at last is a book, well produced and well illustrated, which is destined to fill a gap on many shelves.

The atomization of liquids as a subject has exercised the active attention of many workers in many lands for many years, but books on the subject are rare. Now Professor Giffen and Dr Muraszew have given us the fruits of their diligent toil in a single book, a book which will engage the attention not only of those directly concerned in the art, but also of those who wish for a compact source of information which previously existed only in scattered leaves.

The various aspects of atomization are considered step by step, in the light of the natural laws involved, and then further illuminated by evidence of a practical kind culled from many sources.

The emphasis is mainly on the performance of the intermittent plain-hole diesel-type atomizer, with the continuous spray swirl type rather trailing along behind, although it is good to see in print at last, available to all, the treatment of the theory of this latter type, which was so ably initiated by Dr E. A. Watson.

The bibliography at the end of the book, containing some hundred references to reports and papers by authors listed alphabetically, shows the breadth of the survey.

Quite inevitably, in a text of this kind, there is a tendency towards repetition, since the testimony of one worker after another is quoted in the reiterative support of the case for this or that conclusion.

It is the present reviewer's opinion that atomizers (and those interested in them) can be separated into two distinct groups, the plain hole intermittent and the swirl-type continuous types. To treat both types simultaneously, as is done in this book, sometimes leads the reader to wonder of which type in particular the authors are speaking at the moment.

A further argument for such a distinction lies in the fact, so scantily recognized in the present book, that continuous spray atomizers are found in such a wide variety of species besides the swirl type. There is a wide range of two-fluid atomizers, using air at low, medium, or high pressure to effect atomization, or medium or high pressure steam for the purpose, and it is certain that the exact mechanism of atomization with these types, in all their own variety of forms, is different from that of plain hole or swirl-type units. Again, the centrifugal or rotating-cup atomizer, which may find commercial application for the purpose of product processing by spray drying, is never used as a fuel atomizer by itself. In fuel burning an air blast is invariably directed through a relatively narrow annulus round the edge of the cup and serves to promote fine atomization where otherwise the ensuing spray would be much too coarse for efficient combustion.

For the foregoing reasons it is felt that in a subsequent edition this interesting book might with advantage do two things. The solid injection types might be dealt with in separate sections, with perhaps a separate chapter to note their points of divergence and similarity. In addition a chapter or section might be added exemplifying the wide variety of types of atomizer which are to be encountered in the field, and few of which are mentioned in the present text. In a new book of this type there are surprisingly few errors, which does credit to the authors and publisher alike.

On p. 61 the text quotes the abscissa function as $\log \log \frac{1}{R}$, but in the graph Fig 11–14 it is shown as $\log \log \frac{100}{R}$.

The suffixes 1 and 2 in relation to D, on p. 102, are stated to refer to the circumferences of the swirl chamber and orifice respectively, when presumably they refer to diameters.

There is a misprint in Fig 6–8, p. 140, where the first abscissal figure should be 10 and not 0, as shown.

One hopes this book will enjoy the wide attention it deserves. It will help to resolve some outstanding controversies. It will also stimulate some new ones.

J. R. J.

ADDITIONS TO THE LIBRARY

Pétrole : Propriétés et Utilisations. Vol. II. A. Cabaret *et al.* Paris : Presses Documentaires, 1953. Pp. 313. 21 × 13 cm. Frs. 1800.

This publication (of which Vol. I has not yet appeared) is one in the series issued by the "Centre technique d'enseignement ouvrier," and is intended for operators, charge hands, and similar personnel. The standard of presentation is by no means too elementary, and is suitable for, say, junior chemists who are making their first contact with the petroleum industry. The book is divided into 5 parts which (with their respective authors) are : liquefied petroleum gases (Cabaret) ; fuel characteristics and their relation to engine performance (Durier) ; gas oils and diesel fuels (Lefebvre de Giovanni) ; heating by liquid fuels (Guillermic) ; petroleum bitumens (Lefol).

Oil and Petroleum Year Book 1953. Walter E. Skinner (compiler). London : Walter E. Skinner, 1953. Pp. 327 + cxii. 20*s*.

Includes detailed particulars of over 800 companies engaged in the petroleum industry throughout the world. Information given concerns directorate, finance, and operations. A buyers' guide to oilfield and refinery equipment is subdivided under more than one thousand headings.

Hazardous Industries. A. S. Minton and W. Thomas (Editors). London : Institution of Fire Engineers, 1953. Pp. 104. 6*s*. 0*d*. post free.

In this useful booklet the hazard is fire, and pertinent information concerning nearly 80 industries is given. Practical data rather than detailed technicalities have been the object in the production of the book, and it should be of considerable use to the fire engineer in whatever industry he may be practising.

British Standards.

B.S. 916 : 1953. Black Bolts, Screws, and Nuts. Hexagon and Square, with B.S.W. Threads, and Partly Machined Bolts, Screws and Nuts, Hexagon and Square with B.S.W. or B.S.F. Threads. Pp. 20. 3*s*. net, post free.

B.S. 1981 : 1953. Unified Machine Screws and Machine Screw Nuts. Pp. 34. 6*s*. net, post free.

B.S. 2007 : 1953. Circular Gear Shaving Cutters : Accuracy. Pp. 5. 2*s*. net, post free.

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